Science and Invention

JUNE
25 CENTS

Streams of Steel
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Norman Bel Geddes—Master Builder—
An Interview

Hitch-Riding Through the Skies
By Captain Frank Hawks

Last Chance to Enter Basement Plan Contest *(See Page 118)*

42 Miles on 1 Gallon of GAS

WILL YOUR CAR DO IT ?

New Moisture Humidifier & Carbon Eliminator

for all Makes of Cars, Trucks, Tractors and Engines

An amazing Scientific Humidifier has been patented throughout the World that beats any ever got out. It makes engines run ALL THE TIME with the same wonderful efficiency they do on a cool moist night. It gives MORE pep and power, HIGHER top speed, eliminates hard carbon, and gives AMAZING mileage. Fords report 28 to 42 miles per gallon. Other makes (both American and Foreign) report marvelous increases of ¼ to double mileage. Some of the best records are:

	Miles		Miles		Miles		Miles
Buick	28¼	Essex	32	Nash	30	Pierce Arrow	22
Cadillac	21½	Ford (Model T)	42	Oakland	31	Pontiac	31
Chevrolet	41	Ford (Model A)	40	Oldsmobile	34½	Reo	26½
Chrysler	30¾	Hudson	23½	Packard	21½	Studebaker	29
Dodge	31½	Hupmobile	24½	Plymouth	29	Whippet	41
Durant	41¾	Marmon	21½	Graham-Paige	23½	Willys-Knight	29

And Hundreds of Other Wonderful Records on ALL American and Foreign Makes

Big Profits

to

Man with Car

Spare or Full Time

$350 to $1500 a month

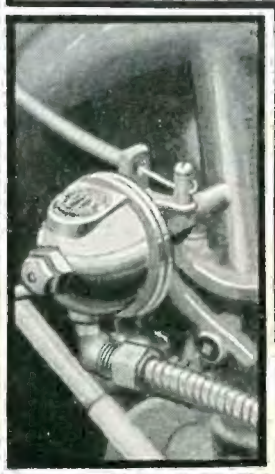
1 man $4,939.66 in 3¾ months.
Another $1,656.60 in 58 days.
$5,150.00 in 5 months to another.
BIG MONEY can be—IS being made.

Fitting Motors With Vix

One man sold 8 first morning. Another sells all 3 men can install. Another's profits as high as $100.00 a day.

VIX sells itself by 8 STARTLING demonstrations — BIG, STUNNING, ASTOUNDING DEMONSTRATIONS. Successful VIX men make MORE MONEY than they ever made before.

Free Trial Try This New Principle Gas Saver AT MY RISK



Pictures here and at top show Model "B" VIX attached to my own New Model A Ford. This car is wonderfully improved in performance with the VIX Moisture Humidifier. So is every Auto, Truck, Tractor. Taxi, Bus, Marine, Stationary and Aircraft Engine, both American and all Foreign makes.

Try this wonderful VIX Moisture Humidifier and Carbon Eliminator AT MY RISK on YOUR OWN CAR to prove that VAPOR MOISTURE (drawn from Radiator to Engine) gives you that wonderful night driving effect ALL THE TIME with MORE mileage from gas and oil—eliminates hard carbon accumulation — gives MORE power, a SNAPPIER, PEPPIER motor. FASTER acceleration, a SMOOTHER, QUIETER running engine and HIGHER top speed.

VIX will PROVE ITS MONEY SAVING MERIT on your own car by 8 DEMONSTRATIONS—conducted by yourself AT MY RISK—the most SENSATIONAL, most ASTOUNDING, most CONVINCING DEMONSTRATIONS you ever saw. If you don't find from your tests that it does MORE than I claim, return it and it COSTS YOU NOTHING. **I want wide-awake, hustling, County, State, Province and National Agencies everywhere, part or full time, to make $350 to $1500 per month filling the great DEMAND for this wonderful invention wherever introduced. Write for my FREE TRIAL and MONEY MAKING OFFER. Use coupon below.**

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Inventor and Manufacturer, 863-Q Street, WHEATON, Ill., U. S. A.

GUARANTEED TO SAVE { 1/4 to 1/2 Gas, Carbon Cleaning, Engine Repairs

or Costs You Nothing

FREE VIX offer Mail Now

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INVENTOR and MANUFACTURER
863-Q Street, Wheaton, Ill., U. S. A.

Please send me without obligation or charge your FREE TRIAL and MONEY MAKING VIX OFFER.

Name.....

Address.....

Town..... State.....

I will show You too

how to start a spare time or full time *Radio Business of Your Own*

on *extra money* you can make *while learning*

J. E. Smith, Pres., National Radio Institute

Here are a few examples of the kind of money I train *"my boys"* to make

Started with $5. Now has Own Business

"Can't tell you the feeling of independence N.R.I. has given me. I started in Radio with $5, purchased a few necessary tools, circulated the business cards you gave me and business picked up to the point where my spare time earnings were my largest income. Now I am in business for myself. I have made a very profitable living in work that is play."

HOWARD HOUSTON,
512 So. Sixth St., Laramie, Wyo.

$700 in 5 Months Spare Time

"Although I have had little time to devote to Radio my spare time earnings for five months after graduation were approximately $700 on Radio sales, service and repairs. I owe this extra money to your help and interest. Thanks for the interest shown me during the time I studied and since graduation."

CHARLES W. LINSEY,
537 Elati St., Denver, Colo.

$7396 Business in two and one-half Months

"I have opened an exclusive Radio sales and repair shop. My receipts for September were $2332.16—for October, $2887.77 and for the first half of November, $2176.32. My gross receipts for the two and one-half months I have been in business have been $7396.25. If I can net about 20% this will mean a profit of about $1500 to me."

JOHN F. KIRK,
1514 No. Main St., Spencer, Iowa.

My Free book gives you many more letters of N. R. I. men who are making good in spare time or full time businesses of their own

The world-wide use of receiving sets for home entertainment, and the lack of well trained men to sell, install and service them have opened many splendid chances for spare time and full time businesses. You have already seen how the men and young men who got into the automobile, motion picture and other industries when they were young had the first chance at the key jobs—and are now the $5,000 $10,000 and $15,000 a year men. Radio offers you the same chance that made men rich in those businesses. Its growth is opening hundreds of fine jobs every year, also opportunities almost everywhere for a profitable spare time or full time Radio business. "Rich Rewards in Radio" gives detailed information on these openings. It's FREE.

So many opportunities many make $5 to $30 a week extra while learning

Many of the ten million sets now in use are only 25% to 40% efficient. The day you enroll I will show you how to do ten jobs common in most every neighborhood, that you can do in your spare time for extra money. I will show you the plans and ideas that are making as high as $200 to $1,000 for others while taking my course. G. W. Page, 107 Raleigh Apts., Nashville, Tenn., writes: "I made $935 in my spare time while taking your course."

Many $50, $60 and $75 a week jobs opening in Radio every year

Broadcasting stations use engineers, operators, station managers, and pay $1,800 to $5,000 a year. Radio manufacturers continually need testers, inspectors, foremen, engineers, service men, and buyers for jobs paying up to $15,000 a year. Shipping companies use hundreds of operators, give them world-wide travel at practically no expense and pay $85 to $200 a month. Radio dealers and jobbers are continually on the lookout for good service men, salesmen, buyers, managers, and pay $30 to $100 a week. Talking Movies pay as much as $75 to $200 a week to the right men with Radio training. My book tells you of other opportunities in Radio.

I will train you at home in your spare time

Hold your job until you are ready for another. Give me only part of your spare time. You don't have to be a high school or college graduate. Hundreds have won bigger success. J. A. Vaughn jumped from $35 to $100 a week. E. E. Winborne seldom makes under $100 a week now. The National Radio Institute is the Pioneer and World's Largest organization devoted exclusively to training men and young men, by correspondence for good jobs in the Radio industry.

You Must Be Satisfied

I will give you an agreement to refund every penny of your money if you are not satisfied with my Lessons and Instruction Service when you complete my course. And I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also train you in Talking Movies, give you home experiments in Television, cover thoroughly the latest features in sets such as A. C. and Screen Grid.

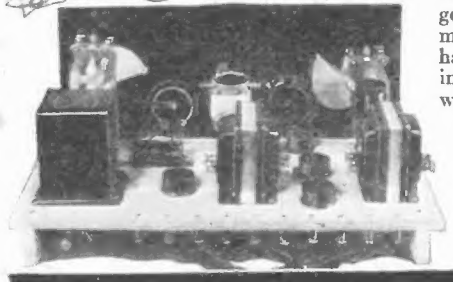
My 64-Page Book Gives the Facts

Clip and mail the coupon now for "Rich Rewards in Radio." It points out the money-making opportunities the growth of Radio has made for you. It tells of the opportunities for a spare time or full time Radio business of your own, the special training I give you that has made hundreds of other men successful; and also explains the many fine jobs for which my course trains you. Send the coupon to me today. You won't be obligated in the least.

Get my new book It points out what Radio Offers You

Rear view of 5-tube Screen Grid Tuned Radio frequency set — only one of the many circuits you can build with my parts.

You'll get practical Radio Experience with my new 8 Outfits of Parts that I'll give you for a *Home Experimental Laboratory!*



My course is not all theory. You use the 8 Outfits I'll give you, in working out the principles, diagrams and circuits used in modern sets and taught in my lesson books. This 50-50 method of home training makes learning easy, fascinating, interesting. You get as much practical experience in a few months as the average fellow who hasn't had this training gets in two to four years in the field. You can build over 100 circuits with these parts. You experiment with and build the fundamental circuits used in such sets as Crosley, Atwater-Kent, Eveready, Majestic, Zenith, and many others sold today. You learn how these circuits work, why they work, how they should work, how to make them work when they are out of order.

J. E. SMITH, *President*
Dept. OFS
National Radio Institute
Washington, D. C.

THIS COUPON IS GOOD FOR ONE *FREE* COPY OF MY NEW BOOK — mail it TODAY

J. E. SMITH, *President*,
National Radio Institute, Dept. OFS
Washington, D. C.

DEAR MR. SMITH:—Send me your book. I want to see what Radio offers. I understand this request does not obligate me and that no agent will call.

Name.....

Address.....

City.....*State*.....

Get the facts on my Lifetime Employment Service to all Graduates

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VOL. XVIII Whole Number 206 June, 1930, Number 2

SCIENCE AND INVENTION. Published monthly by Experimenter Publications, Inc., at 184-10 Jamaica Ave., Jamaica, N. Y. Entered as second class matter, at the Post Office at Jamaica, N. Y., under the Act of March 3, 1879. Title registered at the U. S. Patent Office.

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More to Come

Radio now offers ambitious men the greatest Money-Making Opportunity the world has ever seen! Hundreds of trained service men are needed by radio dealers, jobbers, and manufacturers!

A "trained" Radio "Service and Repair" man can easily make $40 to $50 a week, and it's very common for a "trained" man with experience to make $75 a week, and up.

BIG MONEY for Spare-Time Radio Work is easily made in every city and village. You can now qualify for this Big-Money work quickly through R. T. I. Get the Big Money Now and go up and up in this Big Pay field. The Radio industry calls for More Men, and R. T. I. supplies what the industry wants you to know.

Supervised by Radio Leaders

R. T. I. training is prepared and supervised by prominent men in radio, television and talking picture engineering; distributing; sales; manufacturing; broadcasting, etc. These men know what you must know to make money in Radio. You learn easily in spare time at home with the R. T. I. wonderful combination of Testing Outfits, Parts, Work Sheets, Job Tickets. It is easy, quick and practical, covers everything in Radio—includes Talking Pictures and the latest in Television. Get started in Big Money Radio work now.

$60-$70-$80-PER WEEK AND UP. That's what R. T. I. training leads to. Send for the R. T. I. Book and see for yourself.

No Experience Needed

ALL YOU NEED is ambition and the ability to read and write. The Radio industry needs practical trained men. Remember, R. T. I. makes it easy to earn spare time money while you learn at home.

More to come

THE MEN who get into this Big-Money field now will have an unlimited future. Why? Because this billion dollar Radio industry is only a few years old and is growing by leaps and bounds. Get in and grow with it. $10 to $25 per week and more is easily made in spare hours while you are preparing for Big Money. TELEVISION, too, will soon be on the market, so the leaders say. Be ready for this amazing new money-making field. Remember, R. T. I. "3 in 1" home-training gives you all the developments in Television and Talking Picture Equipment, together with the complete Radio Training.

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Do not start R. T. I. training if you are going to be satisfied to make $15 or $20 per week more than you are now. Most R. T. I. men will make that much increase after a few weeks. There is no reason to stop short of the Big Money Jobs or the Big Profits in a spare time or full time business of your own. No capital needed. Get started with R. T. I. now. Make money while you learn at home.

R. T. I. Book Now FREE

The thrilling story of Radio, Television and Talking Pictures is told with hundreds of pictures and facts—its hundreds of big money jobs and spare time money-making opportunities everywhere. Send for your copy now. USE THE COUPON.

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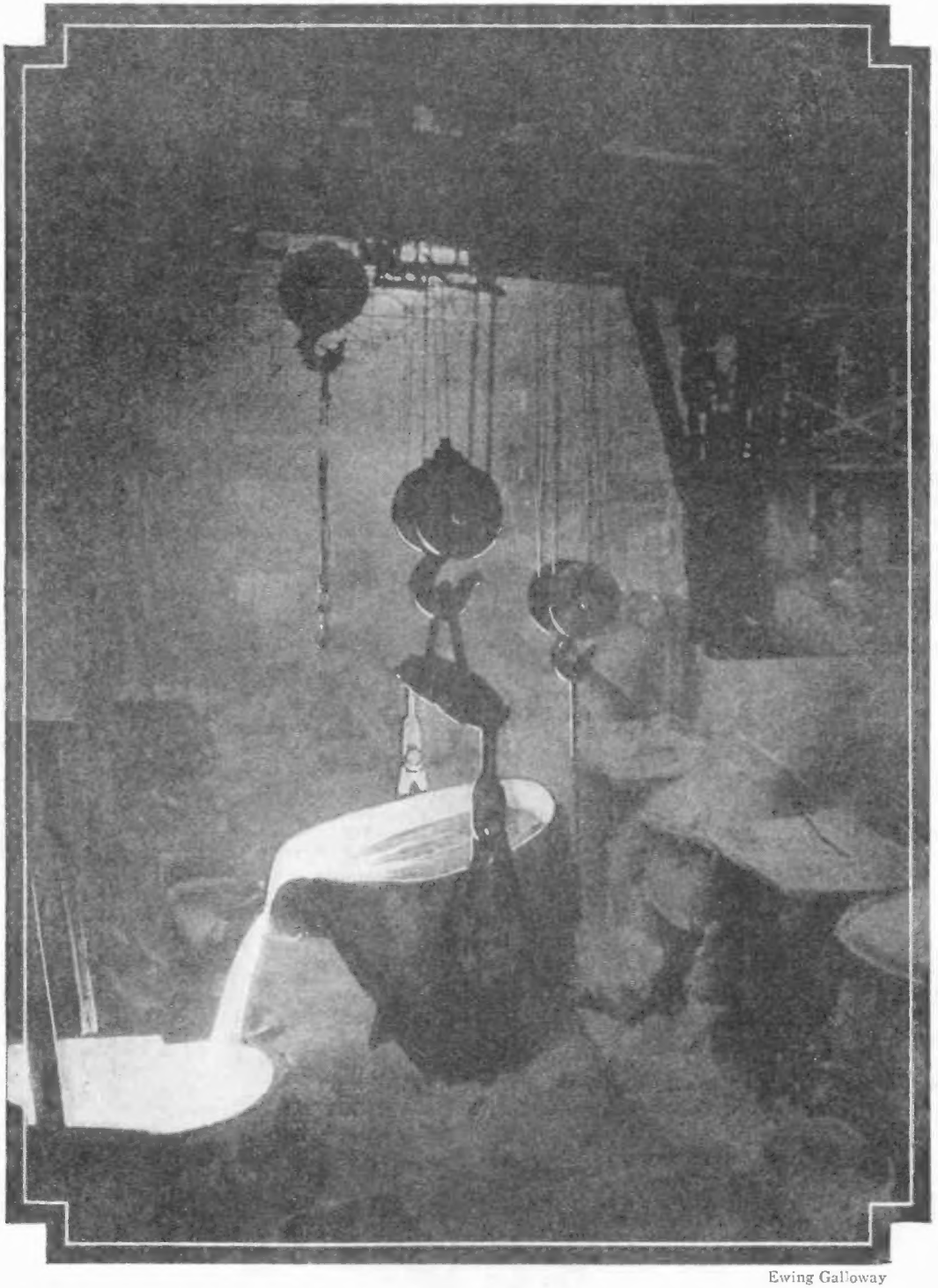
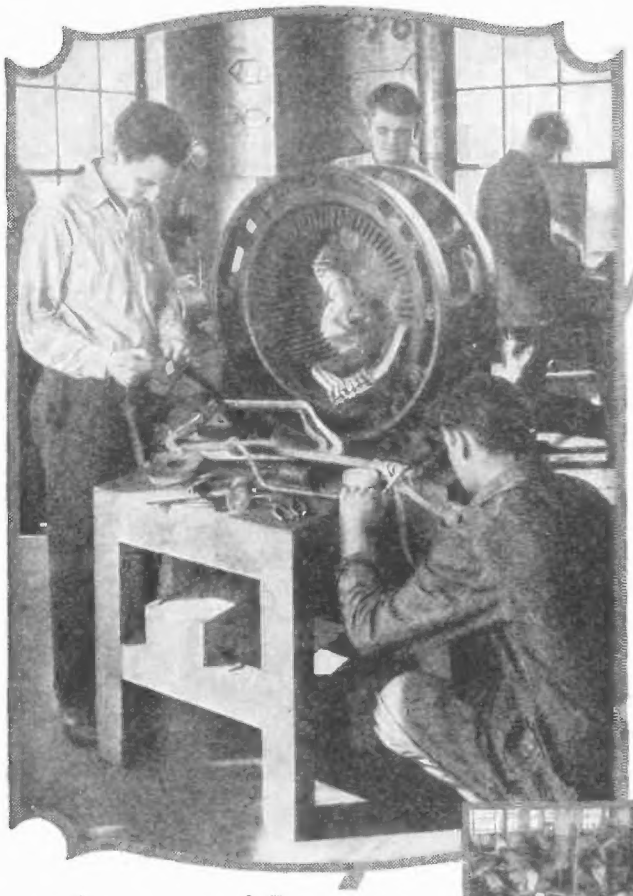


Ewing Galloway

Standing alone in his cab, the crane operator lifts, carries, and pours this giant ladle of molten metal with the ease and accuracy of a débutante handling a cup of tea. . . . Thus thoroughly has man accustomed himself to the Age of Science and the marvelous extensions of his physical powers it has placed at his command.



Coyne students taping and putting in new coils in 200-horsepower A. C. stator.

Getting BIG PAY *in* ELECTRICITY *is really easier than you imagine*

TWO weeks after graduation, Clyde F. Hart got a position as electrician for the Great Western Railroad at over $100 a week. That's not unusual. I can name Coyne men making up to $600 a month. You can start a radio, battery, or auto electrical business of your own and make up to $15,000 yearly! How easy it is to clip and mail the coupon and *find out how* YOU could do it. Say good-bye to $25 and $30 a week. There's a quick easy way to become a practical electrician in 90 days and qualify for jobs that lead to $50, $60 and more, in ELECTRICITY.

Learn with your own hands in the Great Coyne Shops!

The secret of Coyne training is that it is all practical work. Here in the great Coyne shops you learn all about Electricity by actual work on a gigantic outlay of real electrical equipment the same as you will work on in the field. It makes no difference whether you're 16 or 48—whether you can't tell an armature from an air brake—I'll see you through.

No Books—No Printed Lessons

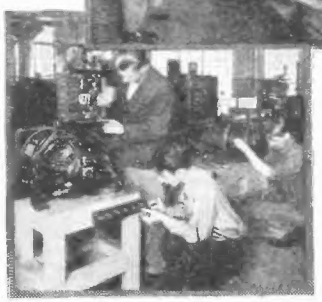
You lose no time studying dry books or printed lessons, or memorizing puzzling theory. You go right to the aircraft engine, dynamo, or other equipment, and an expert shows you step by step all the secrets of electricity essential to your success. And when you're through, our employment bureau gives you lifetime service.

Railroad Fare Allowed

Make up your mind today to get into one of these big pay jobs. If you act now—I'll allow your railroad fare to Chicago and include these courses free! AVIATION ELECTRICITY, RADIO and AUTOMOTIVE ELECTRICITY! And besides that, I help you to a part time job while learning! Don't lose another minute—make this the turning point in your life. Send this coupon RIGHT NOW.

These Coyne men are connecting up, testing, and repairing A. C. motors and controls.

Operating and testing motor-generator sets at the great Coyne shops.



Coyne men wiring and operating automatic controllers.

LEARN IN 90 DAYS

By working with tools—not with puzzling books, nor nerve racking printed lessons.

Prepare for Jobs Like These

Big Pay Jobs are common in electricity. Our free employment bureau puts you in touch with openings to choose from. The following are only a few of the kind of positions you fit yourself for in the Great Shops of Coyne:

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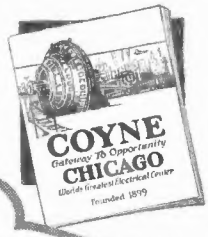
Auto Electrician $60 a Week and up
Inventor Unlimited Income
Maintenance Engineer $60 a Week and up
Service Station Owner up to $200 a Week
Radio Expert $60 a Week and up
Contractor $3,500 to $15,000 a Year



GET this FREE BOOK

This school is 30 years old—endorsed by many large electrical concerns. Simply mail the coupon and let me tell you all about it in the big, free Coyne book.

COYNE ELECTRICAL SCHOOL

H. C. Lewis, President
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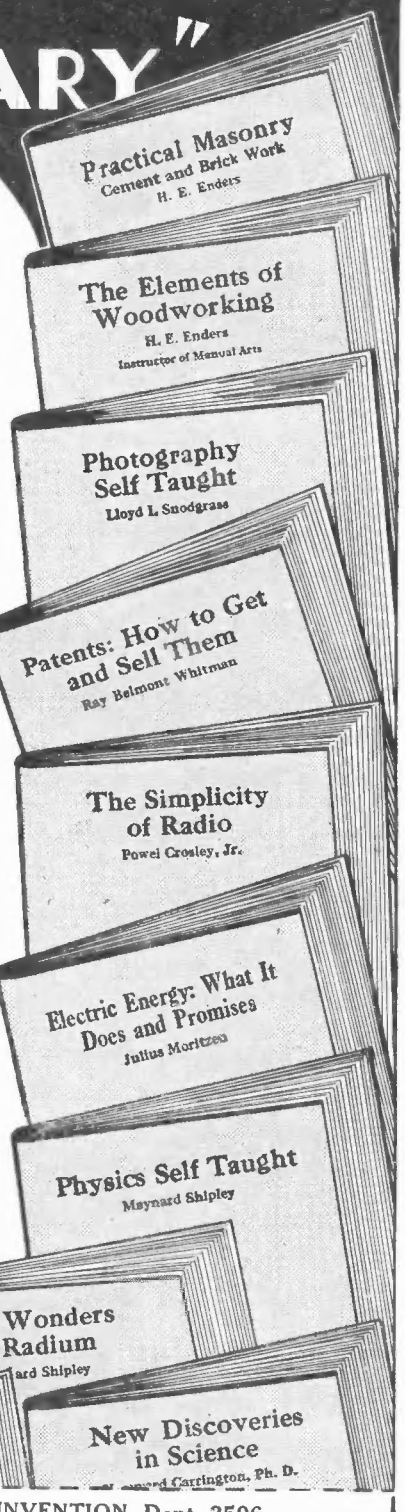

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JUNE, 1930
NUMBER 2

Science and Invention

VOLUME XVIII
WHOLE NO. 206

Published by Experimenter Publications, Inc., 381 Fourth Ave., New York City, N. Y.

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Editorial

The Flight *of the* Pilot

NO flight since Lindbergh's has done as much for the advancement of public confidence in air transportation as the very remarkable flight recently concluded by Zeh Bouck, William Alexander and Lewis Yancey.

The Bermuda group of islands is about fifteen miles long, three miles wide and about 600 miles from the nearest land, and about 675 miles from New York. Airplanes frequently encounter strong winds. If the wind had been blowing from the west at a rate of forty miles an hour, and the aviators had calculated on a wind of but twenty miles an hour, they would have been 160 miles east of Bermuda at the end of their eight hour flight. When searching for such a small target the importance of extremely accurate navigation is immediately apparent.

Zeh Bouck, who conceived and executed this remarkable flight, took this and all of the other important conditions into consideration before the flight was attempted. It was for this reason that he selected as his navigator a man who has demonstrated his ability to navigate in the air with remarkable precision. Captain Lewis Yancey, who was the navigator on the Bermuda trip, was also the navigator on the spectacular flight of the "Pathfinder" which flew from Old Orchard Beach, Maine to Rome, Italy, last summer.

Cross-country flying is dangerous unless it is done with extreme intelligence. Over-sea flying is much more dangerous, and if it is to be conducted with safety it must be done by thoroughly seasoned pilots. William Alexander is such a pilot. He was a member of the Royal Flying Corps during the war and has been on many spectacular flights since that time. He has 7300 flying hours to his credit. When he stepped into the plane he had this wonderful background of experience and it is very likely that some of the flying which he did could have been very embarrassing, if not entirely disastrous, to an inexperienced pilot. Furthermore, Alexander is thoroughly convinced that intelligent flying of long distances must be "Instrument Flying." Unfortunately, there are some among the veteran pilots who have not yet been convinced that this situation is correct.

On any long distance over-seas flight the use of the regular navigation instrument is a foregone conclusion, but the possibility of using radio as an additional safeguard as well as a real convenience has not yet become recognized by flyers and flying organizations themselves, to say nothing of the public. Mr. Bouck, who incidentally, is the Managing Editor of one of our sister publications, Aero News & Mechanics, designed the radio equipment used aboard the Pilot and his remarkable performance of maintaining continuous two way communication between his plane and the radio station of the *New York Times*, located in the heart of New York City, is in itself a very valuable contribution to intelligent aircraft travel.

Rapid transportation and communication are two of the greatest factors in establishing international commerce and good will. Undoubtedly, air transportation of such a well organized character will become an ordinary mode of travel in a surprisingly short time. In blazing this ocean trail and possibly establishing the foundation of an air line of the future, the three flyers who brought to such a happy conclusion this dramatic flight have our hearty congratulations.

Arthur H. Lynch

"Those Who Refuse to Go Beyond Fact Rarely Get as Far as Fact" - - - - - HUXLEY

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"I can bring it back if it doesn't suit?"

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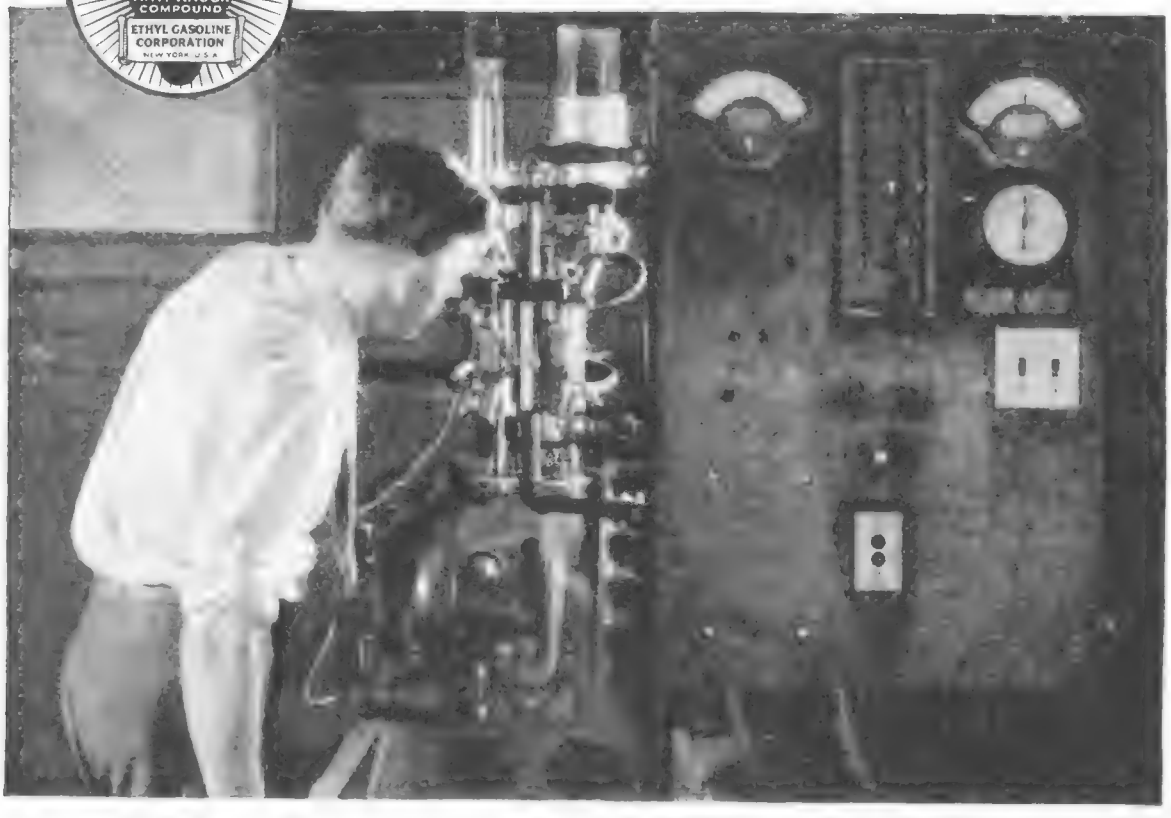

Scene in an Ethyl laboratory, where chemical and engine tests are made to insure the quality and anti-knock rating of Ethyl Gasoline.

IN Ethyl Gasoline you get two things your motor needs: good gasoline *plus* the Ethyl anti-knock compound developed by General Motors Research Laboratories to make gasoline a better motor fuel.

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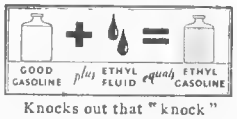

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In short, wherever you drive—whatever the oil company's name or brand associated with it—*any* pump bearing the Ethyl emblem represents quality gasoline of anti-knock rating sufficiently high to "knock out that 'knock'" in cars of ordinary compression and to develop the additional power of the new high-compression models. Drive with Ethyl this week-end. Ethyl Gasoline Corporation, Chrysler Building, New York City.

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ETHYL GASOLINE

SCIENCE *and* INVENTION

Volume XVIII. Number 2

JUNE 1930

Norman Bel Geddes Master-Builder

A Personal Account of a Practitioner of Many Arts and Crafts—an Architect, a Playwright, and an Engineer

By Elizabeth Scudder

"HE builds castles in the air, but he lays their foundations solidly on the ground. He drafts plans, he lays bricks and himself mixes the mortar. He is a master-builder in the widest sense of the word."

Thus, after his fashion, Max Reinhardt characterizes Norman Bel Geddes, who for the Reinhardt production of The Miracle turned the Century theater in New York into the semblance of a Gothic cathedral. And it is a good characterization—provided you are sure to let it cover enough territory: for Norman Bel Geddes is a master builder in many fields.

He is an architect. He is an engineer. He is a mechanic. He is a master of lighting and stagecraft. He is a painter of scenery and portraits. He is a designer of factories and furniture, motor cars and airplanes, scales and window displays. He is a playwright and a playboy—both in the grand manner. And in all these rôles he functions with a sureness that reveals a creative intelligence of immense and integrated power. . . . You get a credible picture of him only when you sight him through a Renaissance telescope. He becomes plausible only when measured in terms not of other men of our time, but of Cellini, DaVinci, and those other figures of the Renaissance who disregarded, or were ignorant of, the lines which guide us into blind alleys.

Norman Bel Geddes

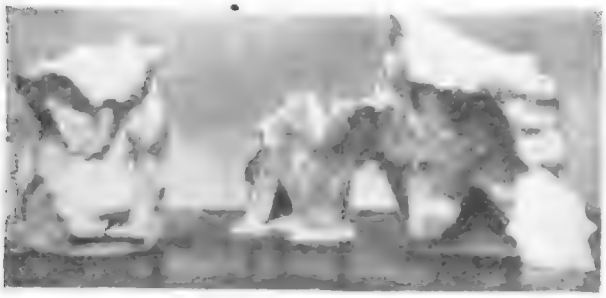
It does not seem precisely logical that the man who designed the blocky alphabet long identified with Dodge Brothers advertising should be planning to produce his own dramatization of Dante's Divine Comedy at the Chicago World's Fair, 1933. Yet it is so. Mr. Geddes is the man. And it is a good bet that he threw himself into the former job with the same intensity he displays toward the latter. With him, nothing is slighted. Whatever he elects to do, he does well.

What is more, he does it with originality and vigor. . . . His setting for The Miracle was admittedly a triumph. The same can be said of his more than ninety other ventures into dramatic design—including the popular musical play, Fifty Million Frenchmen, and the production of Hamlet given last summer at Skowhegan, Maine. His mechanical and lighting effects have played a major part in revolutionizing stage technique. And now he has turned his attention to the industrial and commercial fields and in both is working with the same outstanding success.

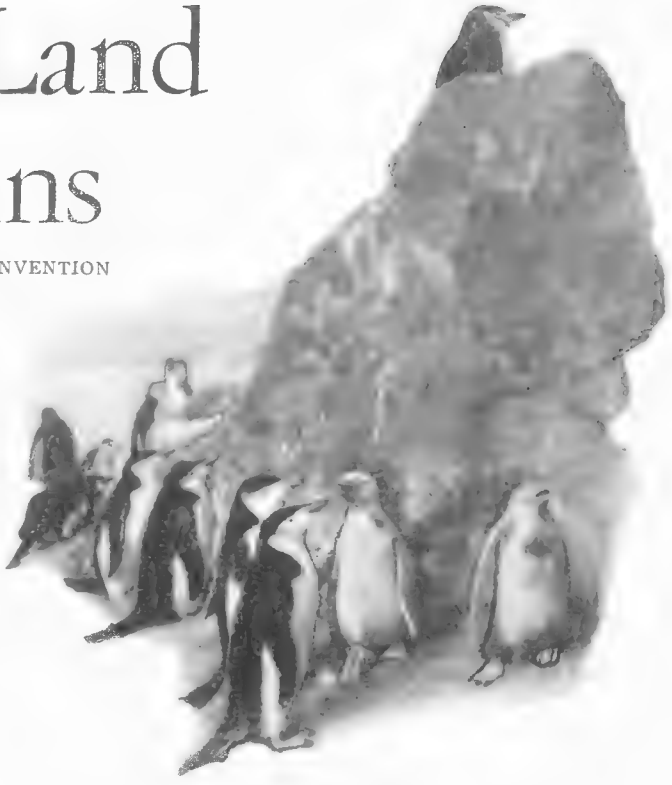
"I do not see that an artist prostitutes his talents by working through the medium of industrial art," Mr. Geddes said recently to the writer. "Only the artist who best expresses his own time will endure. The industrial field is one that offers limitless opportunities for making beautiful those things which are in common usage in our everyday life. An automobile, (*Continued on page* 172)

To Penguin Land with Wilkins

All Photos by International Newsreel, Exclusive to SCIENCE & INVENTION



When Sir Hubert Wilkins flew six hundred miles from Deception Island into the icy Antarctic he encountered many weather-worn icebergs such as those pictured above.



When penguins hold a meeting, they have a lookout on watch for intruders, as this picture shows.

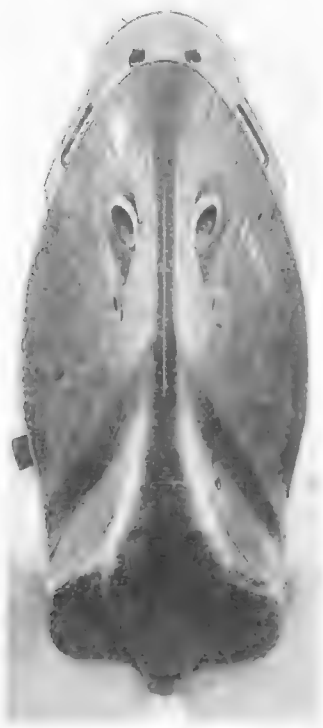
Here are the men who braved the Antarctic. Wilkins is standing in the back row.

Even tractors were included in this invasion of the land south of the Antarctic Circle. This iron steed is clearing away snow to make a landing field for the planes.

One of the expedition's planes, ready to be towed by the Steamer William Scoresby, is shown below.

School's in session in penguin land, by the looks of this picture. One of the members of the Wilkins Antarctic Expedition is giving these men-like birds a lesson in etiquette. They seem a trifle bored, if you ask us anything.

From behind the roaring motors of these two planes many new geographical facts were noted by the expedition's observer. Several new islands were discovered and photographed, and the possibilities of submarine exploration determined.



Europa—New Queen *of the* Seas

By George R. Brown

The overall length of the *Europa* is 936 feet; breadth 101 feet . . . she carries 2,200 passengers and a crew of 975 . . . she can be completely refueled in 7 hours with 5,000 tons of fuel oil and 100 tons of Diesel oil . . . her elliptical smokestacks are 50 feet long diameter, 21 feet short diameter . . . she has three anchors of 17 tons each, four propellers of 14 tons each . . . on her round trip between Bremerhaven and New York she used more than 150 tons of food . . . she has 600 miles of wiring and 10,000 annunciators.

UNDER the wire with eighteen minutes to spare, the steamship Europa, mighty queen of the North German Lloyd, arrived in New York Harbor beneath a barrage of publicity which might well break down the strongest sales resistance of any prospective European passenger. To the raucous blasts of sirens and the cultured voice of a radio announcer the latest style in marine-going hotels pushed her bulbous prow through the misty March morning to maritime glory and more passengers for the Fatherland. Her time for the journey from Cherbourg, France, to Ambrose Lighthouse, off the New Jersey coast, was four days, seventeen hours and six minutes.

Impressive, indeed, is the new holder of the record, both from the exterior and interior point of view, as a subsequent visit to the mighty vessel revealed. Not only is the ship huge but it is beautiful; a combination which even the worthy Roxy has been unable to obtain in his well-known cathedral of the cinema. From bow to stern she is the epitome of good taste in decorations and appointments. It can be truly said that only by the motion created by the gentle swells of the Atlantic would one know that he were not in an extremely luxurious hotel. The decorations are the work of a Teuton, Paul Ludwig Troost. Here one finds everything in the way of luxury. Dining rooms of baronial dimensions, lounges of utmost ease and comfort, a swimming pool of no mean size, several gymnasiums, several movie halls, cabins of outstanding beauty, immaculate kitchens, smoking rooms, broad decks, and several large well-tended bars.

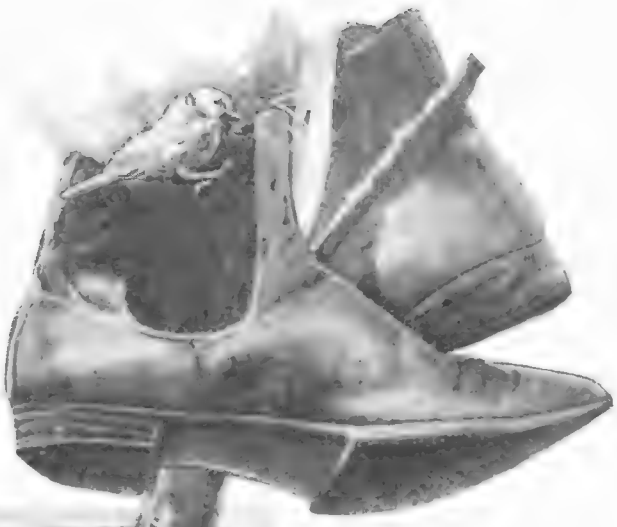
The dance floor of the Europa is inlaid with an intricate pattern of rare woods, while direct and indirect lighting is used to create a night-club effect. Commodore Johnsen, commander of the Europa, is shown in the oval at the right.

The Europa is powered by two sets of turbines forward and two aft, each set consisting of high pressure, intermediate and low pressure sections, connected with the four screws through single reduction gears which reduce the turbine speed of 2100 r.p.m. to 210

(*Continued on page* 159)

Leave It to the Birds!

Look at This Page—Then Ask Yourself: "Which Are More Resourceful—Birds or Men?"



They Just Fit, Too

WHEN a certain family of wrens discovered this pair of old shoes dangling at a distance above the ground, they knew at once that they had arrived at the very house they wanted. One advantage of this type of residence is that you have a spare room to put your friends in when they visit you. . . . The picture below tells the tale of how a family of chippies decided to put themselves under the protection of Uncle Sam until the fledgling period had been safely gotten through. They settled in a mail-box and called it home.

Once Talked Through—Now Lived In

NO matter where you hang your old brown derby, it may be home sweet home to some enterprising family of birds. That is what we learn from the picture to the right. . . . The family in this case belongs to the Flycatcher clan. Somehow or other the hat became wedged in a convenient position between a pair of saplings, and Mr. and Mrs. Flycatcher moved right in.

Who's Afraid?

YOU can't scare a mother robin with human symbols of death and the grave. The picture above shows you a lusty lot of baby robins who were born and raised in a happy home, built right in the upper story of a skull. . . . Nature is like that, we guess. Life and death link along together without much regard for the proprieties. One comes out of the other, and after a while merges with it again—which may or may not be good philosophy. Anyway, it's an interesting picture, and very likely Hamlet would say something about it worth listening to, if he could.

Steam Heat and Travel Free

SNUGLY supported on the steampipe drip of a P. and R. baggage car, the birds who own this nest made a daily trip for a considerable period between New Hope, Penna., and the Reading terminal at Philadelphia. That's what you could call *enterprise*, without a shade of exaggeration.

Meet Your *New* Planet

American Astronomers Locate Trans-Neptunian Body Predicted by Lowell in 1911. Ninth Planet Lies Four Billion Miles from Sun

By Joseph H. Kraus

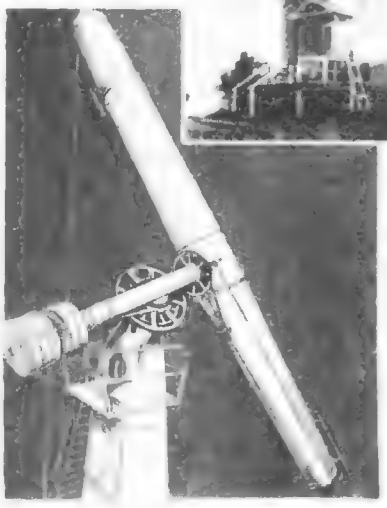
Arrows point to the new trans-Neptunian planet as photographed through a 24-inch telescope at the Lowell Observatory, Flagstaff, Arizona. The bright star showing crossed lines of light is Delta Geminorum.

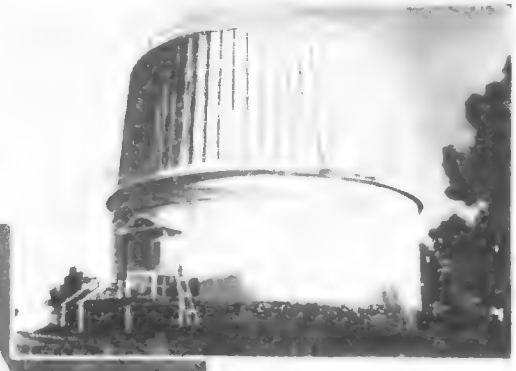
ANY heavenly body of the planetary type revolving about the sun, or about some other primary, moves in strict accord with Newton's formulation of gravitation. When an orbit for a planet has been predicted, and the planet is not located at the exact predicted position at a specified time, it becomes obvious that there is some other force, some unseen disturber, that is interfering.

In 1905 Dr. Percival Lowell, who founded the Lowell Observatory at Flagstaff, Arizona, began a mathematical investigation for a planet beyond Neptune. Observing residual motion in the paths of Saturn, Uranus and Neptune, Lowell concluded that another planet beyond Neptune, and as yet undiscovered, was creating the disturbance.

Clyde W. Tombaugh, youthful photographer at the Lowell Observatory, who on January 21st noted a small speck of light on an astronomical photograph. This dot proved to be the new planet.

Below: The telescope with which the new planet was photographed.





Left: The Lowell Observatory at Flagstaff, Arizona. In this prosaic looking building is a 24-inch telescope which was pointed to the heavens while photographs were being taken. It is here that the new planet was ferreted out.

In 1915, a year before his death, Lowell published his "Memoir on Trans-Neptunian Planet," in which he predicted the direction of a new planet and discussed the subject in the following more generalized form. "It indicates for the unknown mass between Neptune's and the earth's, a visibility of the 12-13 according to the albedo and a disk of more than one second in diameter." He called the trans-Neptunian body Planet X.

On January 21st of this year, Mr. Clyde W. Tombaugh, youthful photographer at the Observatory, saw a tiny spot on one of these plates and called attention to it. The photograph was taken with a highly efficient special instrument that was installed for the search of this trans-Neptunian planet early last year. With this revelation, investigations were intensified, and on March 13th, Dr. V. M. Slipher, of Lowell Observatory, announced the new discovery and officially added the ninth, as yet nameless planet, to our solar system.

Up to the present time any definite information regarding the new planet is very vague. The difficulty of observing it over a long enough period of time so that accurate measurements can be made is, of course, present in any body so far away. The following data may be of interest. The new planet is approximately 4,185,000,000 miles away from the sun. It is practically six degrees away from the spot where Professor Lowell indicated it would be. Six degrees is equivalent to about twelve times the diameter of the moon. Tentative figures on its size and rotation period, based upon computations of astronomers at the Lowell Observatory, would seem to indicate that the new planet is undoubtedly larger than the earth and may even be bigger than Jupiter, which is the largest member of the solar

(*Continued on page* 179)

Captain Hawks taking off in tow at the controls of the Eaglet. It was in this specially modified cabin glider that he was towed from the Pacific to the Atlantic seaboard behind J. D. Jernigin, Jr's., single-motored biplane.

Hitch-Riding Through *the* Skies

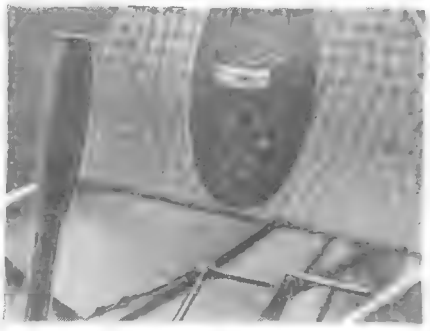
By Captain Frank M. Hawks

Holder of the Transcontinental Airplane Speed Record

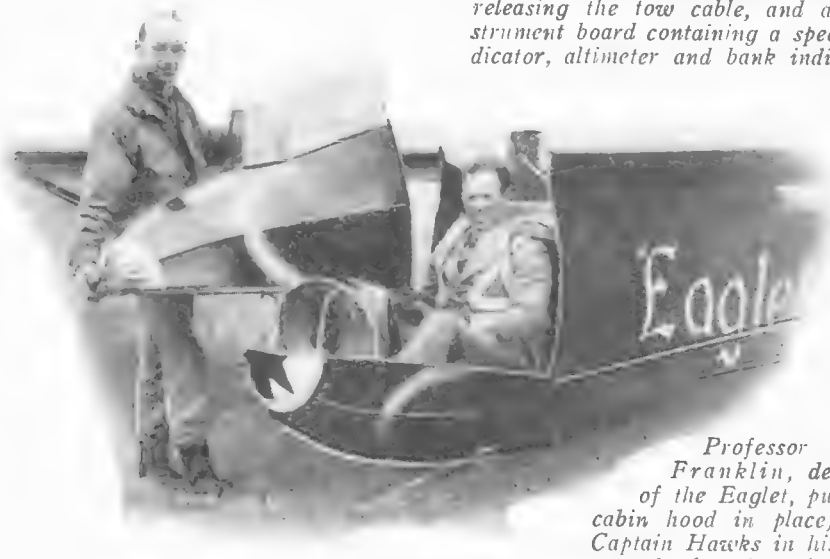
The First Man to Make a Motorless Transcontinental Flight Tells About Gliding from His Angle

THE object of my transcontinental flight in a glider was to stimulate interest in gliding. To make a demonstration that would be convincing to the public in general and to the Aircraft Industry, we decided to build a glider of sufficient strength to withstand a tow behind an airplane and still have very commendable soaring qualities so that when cutting loose over a city or town, a first-class demonstration of soaring about without power could be made.

The machine which I now have and with which I flew from the West Coast to New York is a soaring machine but stressed up for airplane tow. It was built by Franklin Brothers in Ann Arbor, Michigan, and I quite liked it as it was, and only made one suggestion—and that was to have a streamline coupé or cabin made of pyrelex.



The Eaglet's controls comprise a stick, rudder, pedals, brake handle, ring for releasing the tow cable, and an instrument board containing a speed indicator, altimeter and bank indicator.



Professor R. E. Franklin, designer of the Eaglet, puts the cabin hood in place, with Captain Hawks in his seat, ready for the take-off.

A line supported by a tow cable enabled Captain Hawks to hold the first conversation ever conducted over a wire between aircraft in flight on this cross-country trip. Here he is demonstrating how he phoned Jernigin.

This was for two reasons, one for comfort and the other to increase the efficiency of the glider. In observing the machine's construction, I noted an area behind the pilot's head that presented quite a resistance and it was my thought to eliminate this by the cabin installation and at the same time provide more comfort from the elements. By actual test it was proven that the cabin installation somewhat raised the weight of the glider but at the same time it materially reduced its sinking speed and added to its efficiency as a soarer.

I believe the novice receives the thrill of his life on his first glider flight, though its duration may be only half a minute; he gains a decided feeling of power later when aloft for fifteen minutes, alone.

And I have observed many skeptics make their first glider flight and seen them change (*Continued on page* 164)

The Sky Talkers

How the Author by a Lucky Break Got an Early Close-up of Plane-to-Exchange Telephony, and How, Later, He Used this Method to Report the Third Arrival of the Dirigible Graf Zeppelin

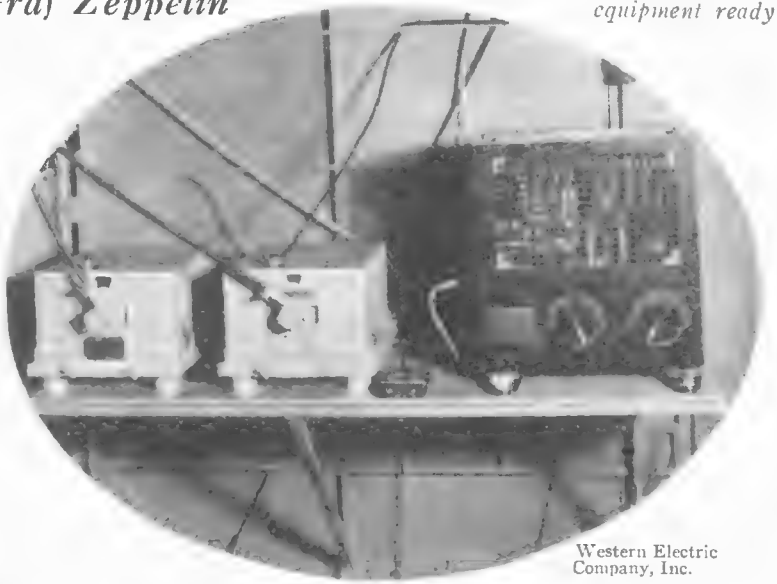
Bell Telephone Laboratories, Inc.

Here is the interior of the Fairchild plane, all set for sky-reporting, with personnel and equipment ready for action.

By William Watts Chaplin

Former Staff Reporter with the Associated Press

WHEN you drop your nickel in the drug store telephone you are doing more than merely paying for a service; you are in effect enlisting on the side of the army of wonder workers whose scientific skill is aimed at sending the human voice ringing around the world and connecting the heavens and the earth.



Western Electric Company, Inc.

This Western Electric short-wave equipment for two-way conversation is installed in the tail of a Western Air Express plane. There is also a long-wave receiver for radio beacon and weather signals.

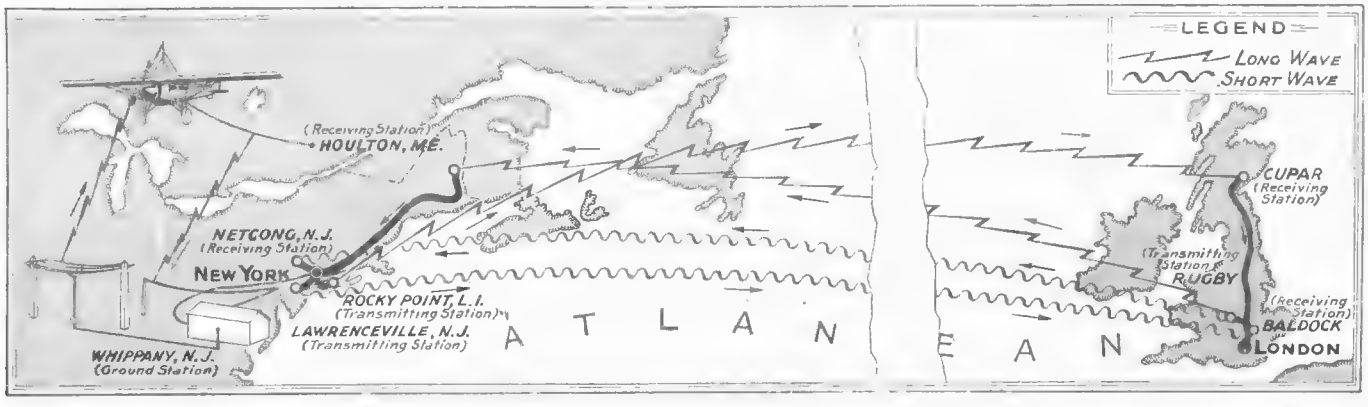
For a part of your nickel, together with many millions of other nickels, goes toward the support of that great science factory on West Street in New York City known as the Bell Laboratories, where literally thousands of engineers and inventors work from day to day on the wizardry of vocal and visual communication.

I have witnessed several experiments with equipment developed in that hive of invention, and among the most interesting were those having to do with two-way conversations between an airplane in the air and regular telephone instruments on the ground both in this country and Europe.

The first demonstration of plane talking was on a drizzling summer day and it seemed to me that every reporter in New York was on hand. Here was (*Continued on page* 179)

Western Electric Company, Inc.

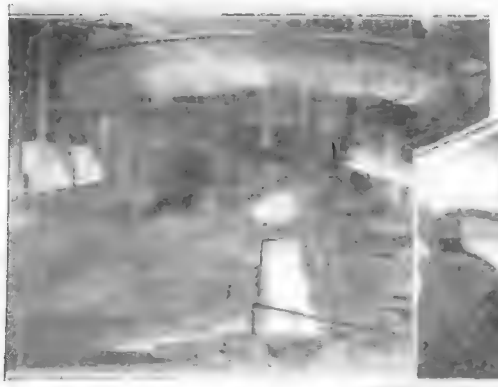
The plane at the left is a Boeing tri-motor flying over the line of the Western Air Express. Below is a diagram showing the system which made Mr. Chaplin's plane-to-London conversation possible.

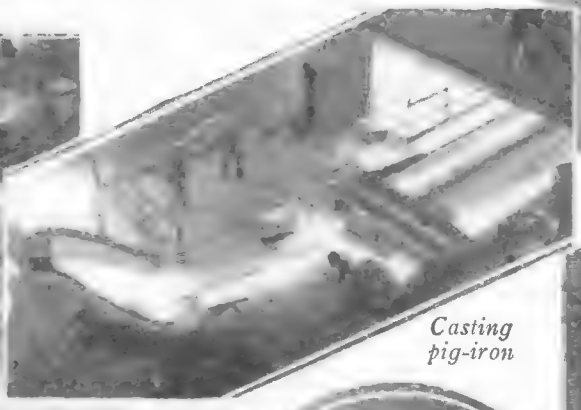


Streams of Steel

A Striking Series of Shots Depicting the Progress of Iron from Ore to Ingot

A Bessemer Converter.





Casting pig-iron

The blast furnace is tapped and a stream of white hot metal flows toward the spout.

Right: From the spout the molten iron pours into ladle cars which carry it to the job foundry, pig casting foundry, or open hearth.

Below: A ladle is tipped. A charge of hot metal pours into an electric steel furnace.

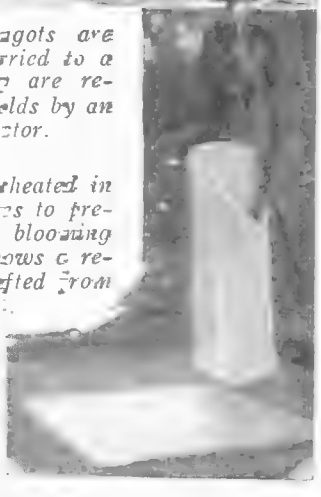
Above: Blast furnace slag is drawn off and carried to a plant where it is made into cement, or is allowed to cool for use in road building. Diagonally to right: Charging a steel furnace.

Right: A heat of steel is being poured from a tilting type furnace into a ladle at the open hearth. Note angle of furnace.

Below: Filling the molds.

Left: After the ingots are poured, they are carried to a building where they are removed from their molds by an overhead extractor.

Right: Ingots are reheated in "soaking pit" furnaces to prepare them for the blooming mill. The picture shows a reheated ingot being lifted from a soaking pit.



Photos on this page courtesy Bureau of Safety Sanitation and Welfare, U. S. Steel Corporation; and the Ford Motor Company.

Here is Prospect Avenue, a principal Cleveland business street, viewed from the Terminal Tower Building.

Considerably complicated is the traffic flow around Cleveland's Public Square.

Unkinking Cleveland's Traffic

By J. Gordon McKay

Director, Cleveland Highway Research Bureau

Bridges, Street Widening, and Grade Separations Combine with Thoughtful Regulation in Cleveland's Solution of a Particularly Difficult Traffic Problem

THE geographic location of Cleveland has had a marked influence upon the highway and traffic conditions in the city and the surrounding territory. Because its business and adjacent residential districts are built up practically to Lake Erie, the city has been unable to expand to the north. This has resulted in an expansion east and west.

Three river valleys add measurably to the traffic problems of the area. The Cuyahoga River valley winds from south to north through the heart of the city. Rocky River runs in the same direction about eight miles west, and the Chagrin River approximately fifteen miles east. The excessive cost of building bridges over the Cuyahoga Valley has resulted in the concentration of traffic on a few main routes. Two bridges now carry the bulk of downtown traffic across the river. One of them, the Central Viaduct, has an average daily traffic of 22,000 vehicles. The other, the Superior-Detroit Bridge, carries 64,000 vehicles daily — an amount exceeded by only one bridge in the United States.

Industrial plants and railroad lines and yards have impeded the development of additional routes. In one case it is planned to carry a new road by viaduct over industrial territory. This will be less costly ultimately than the economic losses due to congestion and indirect routes.

The influence of Cleveland as a traffic center extends thirty miles from the center of the city. Arterial highways radiate like the spokes of a wheel. Converging as they near the city, they pour the traffic from two or

(*Continued on page* 167)

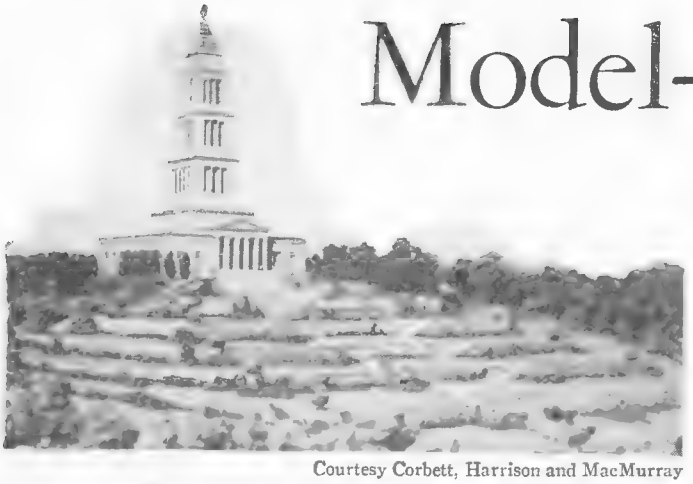
This bridge structure in the south end of Cleveland carries a highway safely across two steam and one electric interurban lines.

More than 64,000 vehicles have been counted in a single day using the western approach to Superior high-level bridge, which crosses the Cuyahoga Valley.

Bulkley Boulevard serves more than 35,000 cars daily. By shifting the distribution of traffic on its four lanes, a valuable flexibility is achieved.

Model-Making Men

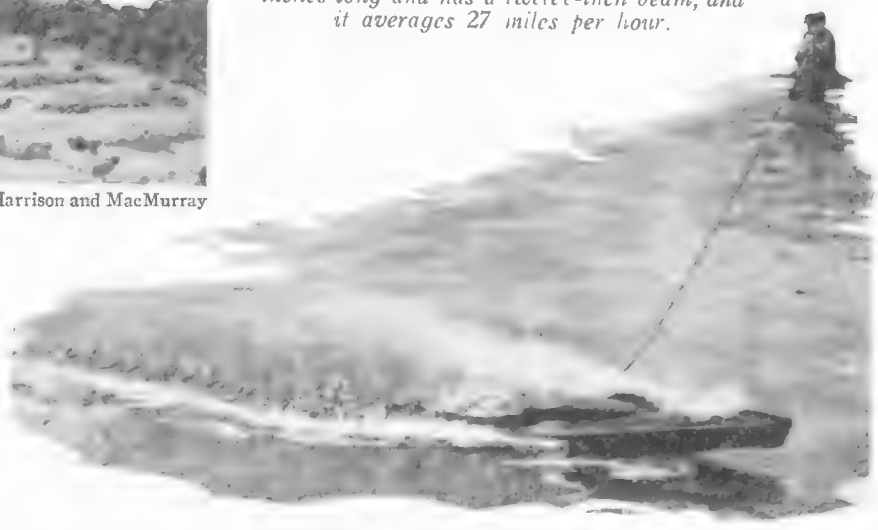
By Mary Jacobs



Courtesy Corbett, Harrison and MacMurray

Models are used extensively for commercial purposes; here's one of the George Washington Masonic National Memorial, at Alexandria, Va.

Walter Elliott's prize-winning craft is thirty inches long and has a twelve-inch beam, and it averages 27 miles per hour.



CHOO-choo-choo-choo — puffing loudly, with sparks flying, the Pennsylvania Division's newest and largest steam type locomotive, Cronkhite built, pulled in on schedule time, after a run of four and one-half hours. Minton Cronkhite examined all of its 22 inches, and found the locomotive and tender in perfect condition.

Meanwhile switchman E. P. Alexander averted a collision between H. O. Havemeyer, Jr.'s Railroad Officials' Business Car, his B. & O. Mountain Type locomotive, R. H. Claudius' New York Central 5200, and J. T. Lozier's steam locomotive—and it was carrying a load of 200 pounds!

Not much of a train load? But a great deal for a model six inches high and 24 inches long, running on miniature steel tracks at the New York Society of Model Engineers' clubrooms. The New York Society of Model Engineers is a group of 125 men for whom

Get Ready, Set, Go! . . . Messrs. Elliott, Zimmer, Bosshardt and Habl ready to race their models in Central Park.

This prize-winning airplane model, a Hawk Curtiss, was shown at the last exhibition of the society. It was built to scale throughout.

Minton Cronkhite examines his ¼ inch scale steam locomotive after a 4½ hour run, and finds it perfect. Above it is J. T. Lozier's 24-inch steam locomotive that carried a 200-pound load.

machines in miniature retain their fascination. They build tracks, steam and electric locomotives, signal stations, switches, derricks, airplanes, skyscrapers, ocean liners—absolutely to scale. It takes a year to make a locomotive—it may take several years to

build a replica of a 13th Century Man-of-War, but Vincent Astor, Minton Cronkhite, Walter Elliott, H. O. Havemeyer, and the father of model making—Berthold Audsley—and their fellow-members of the Society count the time well spent. (*Cont'd on page* 164)

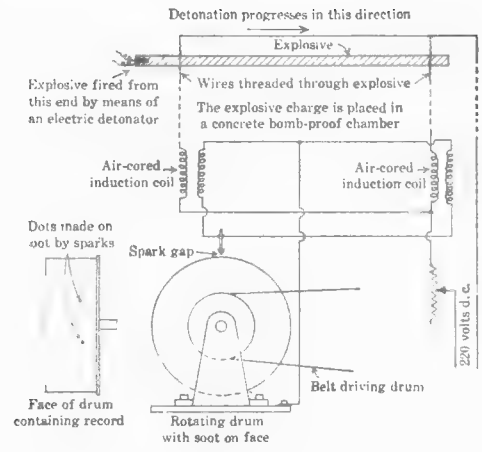
How Fast Is Dynamite?

By G. St. J. Perrott

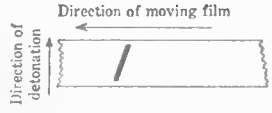
Superintendent Pittsburgh Experiment Station, United States Bureau of Mines

ONE of the most rapid chemical reactions known takes place when a stick of dynamite is detonated. It has been found that the detonation wave travels along a cartridge of dynamite at speeds of one to four miles per second. These speeds are measured at the Explosives Experiment Station of the United States Bureau of Mines, Bruceton, Pa., in connection with research on and testing of mining explosives. In one type of apparatus, the Metegang recorder, shown in Figure 1, the time elapsing between the breaking of two wires threaded through the explosive is recorded on a rapidly revolving smoked drum. The wires are connected in series with the primary circuits of two air-cored induction coils. When the explosive is fired from one end the primary circuits of

(*Con't on pg.* 184)

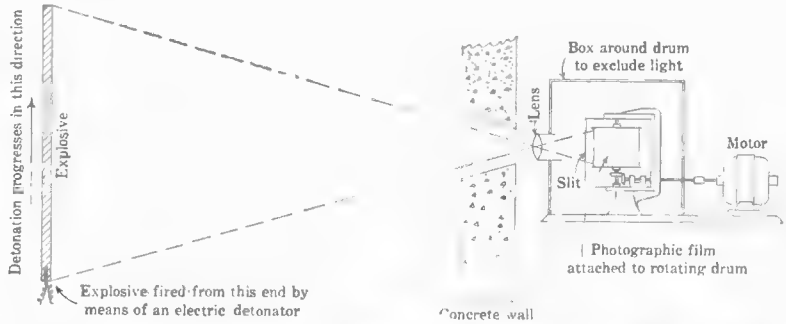

Detonation progresses in this direction
Explosive
Explosive fired from this end by means of an electric detonator
Wires threaded through explosive
The explosive charge is placed in a concrete bomb-proof chamber
Air-cored induction coil
Air-cored induction coil
Dots made on soot by sparks
Spark gap
220 volts d. c.
Belt driving drum
Face of drum containing record
Rotating drum with soot on face

Above—Figure 1.



Photographic record of the speed of the explosive

Right—Figure 2.



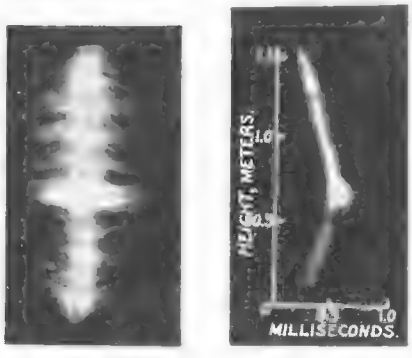


Figure 3A—Recording reaction rate of dynamite charge detonated from both ends simultaneously.

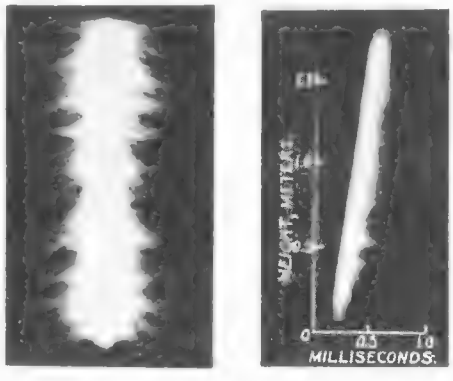


Figure 3B—Recording the reaction rate of a charge of dynamite detonated from lower end.

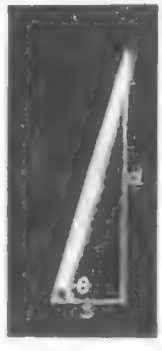


Figure 4—Method of calculating the speed of dynamite from photograph.

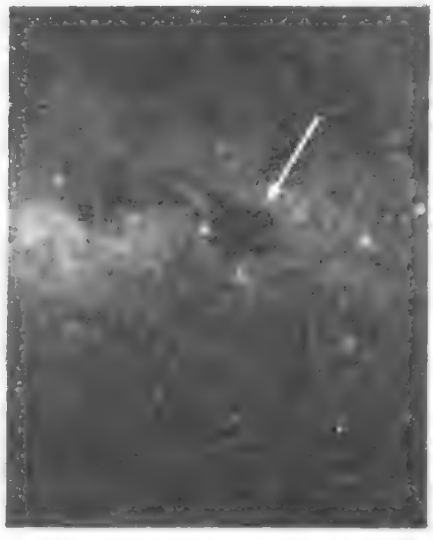
The Celestial Coal Sack

By Donald H. Menzel, Ph.D.

Lick Observatory

IN the Milky Way, but a short distance from the famous Southern Cross, lies an object well known to everyone who has visited the other hemisphere. All the more conspicuous because of its location in one of the brightest parts of the Milky Way, is a gaping void, like a gigantic splash of ink across the sky, where no stars whatever can be glimpsed by the naked eye—the Coal-Sack. At one time astronomers thought that the blackness was truly an absence of stars, but it is now quite definitely established that the Coal-Sack, and the many similar though less conspicuous voids are due to vast areas of cosmic dust that lie between us and the stellar background, thus obscuring it.

Dr. Unsöld, at Harvard Observatory, has determined the distance of the dark nebula by comparing the number of stars that can be photographed within its limits against the numbers visible on the outskirts. He finds that the cloud is nearer than the stars inside it. In other words, the faint stars we photograph are not between us and the obscuring matter, but are seen through it, their light dimmed about sixty percent in transit. The Coal-Sack turns out to be about 450 light years, or 2,700 million million miles away, a tremendous distance, although astronomers will count the object as one of our nearer neighbors in interstellar space. Planetary distances are stated in miles, stellar distances in light years.



Cosmic dust along the Milky Way gives the impression of a blank spot in the heavens—a veritable coal-sack.

Knotty pine panels make this interior strikingly attractive. (National Association of Lumber Manufacturers.)

Another interior in which wood paneling is used to enhance the beauty and cheer of a home.

"Merely *on the* Surface"

Yes—But Surfaces Make All the Difference in the World, Says S. Gordon Taylor, and in This Article He Tells You How to Use Them to Increase the Attractiveness of Your Home

"SAVE THE SURFACE," say the paint and varnish men, "and you save all." Which is true enough in its way—only it fails to go the full length of the truth.

For the fact is that surface treatments do more than *save*. They embellish or mar the attractiveness of a home in a degree that can make all the difference in the world.

You can take a home which architecturally is everything that could be desired, placed in the most fetching surroundings, and furnished in the best of taste. And you can nullify every advantage that these things give. simply by applying the wrong surface treatment.

On the other hand you can take a home that is far from symmetrical, with a relatively homely background, and fur-

An interesting result gained with wallpaper above a painted wainscot. (Lyons & Taylor, Architects.) Right—Cement plaster makes an effective surface for the walls of this basement recreation room. (Portland Cement Ass'n.) Lower right—The charm of rough-textured interiors shows itself in this home.

Last Chance to Enter $400 Basement Plan Contest!

Open to All Readers—See Details on Page 187

Mr. Home Owner

On page 191 SCIENCE AND INVENTION offers a new service which will be of inestimable value to readers who are home owners or hope some day to build or buy their own homes. Through this service a vast fund of information on building materials and equipment is yours for the asking.

by S. Gordon Taylor

The modern idea of using a mesh base for plaster or stucco was independently arrived at in Japan, where not only the foundation but the earth itself may be insecure, the above picture shows. (Ewing Galloway.)

What stucco and a little wood paneling can do for a not-too-young frame house is revealed in these "Before" and "After" views. (National Steel Fabric Company.)

nished with none too great a regard for harmony. And by proper use of the colors and textures of modern surface treatments you can make that home seem little short of ideal.

The beauty of it is that surface treatments form perhaps the least expensive part of the home, and the increased attractiveness they give is available therefore to practically every home owner in the land. Department of Commerce figures say that only 5.3 percent of the total building cost goes into paints and decorations in the average new home, or 7.4 percent if tile cost is included. . . . Truly a small percentage to apply to something which not only beautifies but preserves.

In planning the exterior of a new home, structural and decorative effects can be combined. Face bricks can be obtained in a wide variety of attractive colors and textures. Stucco presents practically limitless possibilities for variations in color, texture. and paneling. Simple wood surfaces can be made extremely attractive by a little originality in the use of paints.

To a certain extent the same rule can be followed in the interior. Plaster can be left with a rough surface that will impart a unique and pleasing effect. The final plaster coat can even be omitted with attractive results.

In many new homes, the plaster surfaces crack so badly within the first year or two that complete redecoration is necessary. This may be due to the sag of load-bearing members, or to the shrinking of poorly seasoned lumber. Sometimes it results from insecure foundations, which permit settling. Metal lath helps to prevent plaster cracks not caused by structural weaknesses. One type, which consists of a welded wire mesh backed by a heavy fibre sheet and stiffened with steel ribs, not only provides a firm plaster base but also reinforces the plaster as steel bars reinforce concrete.

Surface finishes for existing houses should fit the type of surface for which they are intended. Ordinarily brick or stucco surfaces do not require redecorating. However, the wood trim should not be neglected, nor should gutters and downspouts, if they are subject to rust. These should be painted regularly.

In refinishing wood exteriors, paint is the usual medium, but where the wood surface is in bad condition or the old paint is chipped or cracked badly, it may be found better to provide a new exterior treatment. Treated shingles applied over the old wood siding will give the appearance of a new house. This is more expensive than a coat of paint, but will represent an ultimate financial saving. Some types of shingles can be applied at a cost approximately equal to two repaintings. This is comparatively inexpensive, when it is realized that such an exterior will probably not require attention of any kind for fifteen years or more.

Stucco provides another treatment of wood exteriors. Like shingles, it is applied over the old surface. For such work there is a special stucco base available—a welded wire mesh backed with a tough, waterproof, fibrous sheet. It is nailed directly to the old surface and the stucco is then applied. The steel mesh provides solid anchorage and reinforcement, while the fibre backing adds waterproofing and insulating qualities.

For the treatment of interior walls there is an almost unlimited variety of possibilities. There is no need for discussing the time-honored paint and paper treatments except to say that they are available in greater variety than ever.

More recently plastic paints have come into popular use. These are applied like ordinary paints and usually come in powder form, to be mixed with water and tinted on the job. They are applied by brush, but when partly dry are textured to provide any one of a number of decorative finishes. Lacquers are also coming into popularity. Lacquered surfaces are washable and long-lasting, and harmonize nicely with lacquered furniture. Though more expensive than ordinary paints, they are much more durable.

Wallpapers are gaining favor, principally in the treatment of period rooms, especially Colonial. Modern practice combines paint and paper; panels of paper are applied on a painted background or paper is (*Continued on page* 185)

These five pictures show the development of a Rhea Reid rose between June 16, when the side bud was pinched off, to June 25, when the flower reached full bloom. Other beautiful varieties of roses are shown below.

Don't Dream *of* Roses —Grow Them

While the Rose Is Considered Almost Universally the Most Beautiful Flower, Roses Are Not Difficult to Grow. Follow the Suggestions Given in This Article, and See How Easily You Can Surround Your Home with Them

By Dr. E. Bade

THE roses in our gardens today are not the types that were cultivated years ago. Instead of the remontant or perpetual roses, we plant the tea-hybrids, which flower more profusely and are more resistant to disease. Of the remontant hybrids only the dark-red varieties are still being cultivated, for their deep colors are not found in the hybrid teas.

The origin of some of the most beautiful roses remains unknown. They have been propagated solely by grafting and by this means have been spread over the entire world.

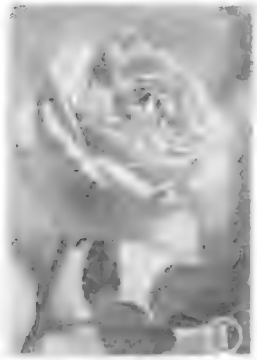
The grafting method is employed in these instances because the types involved will not perpetuate their original character when seed is used.

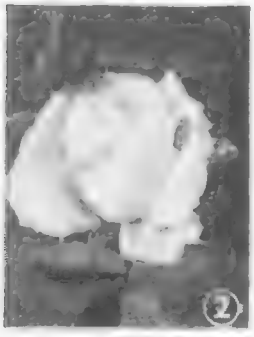
But in fact no roses remain entirely true to type in seed cultivation, although a few of them may and often do resemble the mother plant quite closely. Among these are Gloire de Dijon, Kaiserin Augusta Victoria, and General Jaqueminot, but even these seldom approach the mother plant in charm.

The profuse flowering of roses demands both preparation and care. But many overestimate the amount of work required, and therefore, forego the pleasure of raising them. It is not at all necessary to select a form which demands special care for its cultivation. But success can be obtained only when the type is matched to the purpose—only then will the peculiarities of the individual form be strikingly apparent. The beginner should not attempt to raise any of the non-hardy forms, for only in the hands of an experienced fancier will such a bloom unfold its full beauty.

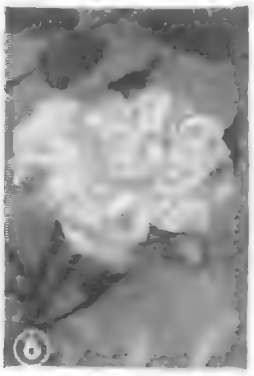
All roses require a deeply-cultivated soil which should not be lacking in lime and which can be kept moderately moist. As a rule roses do not like to be planted in the shade and only a few of them will withstand and tolerate it to a certain degree. Of course, the dark-red forms may have their blossoms discolored or burned if exposed to the full intensity of the sun, but even they should not be shaded by overhanging trees.

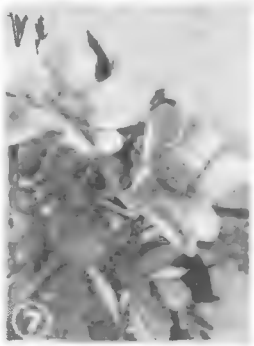
Roses will do well in almost any (*Continued on page* 186)

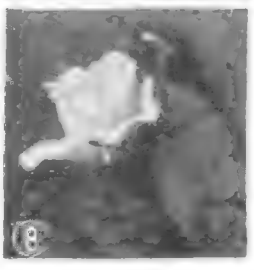




1. *American Beauty*
2. *Frau Karl Druschke*
3. *Mme. Caroline Testout*
4. *Kaiserin Augusta Victoria*





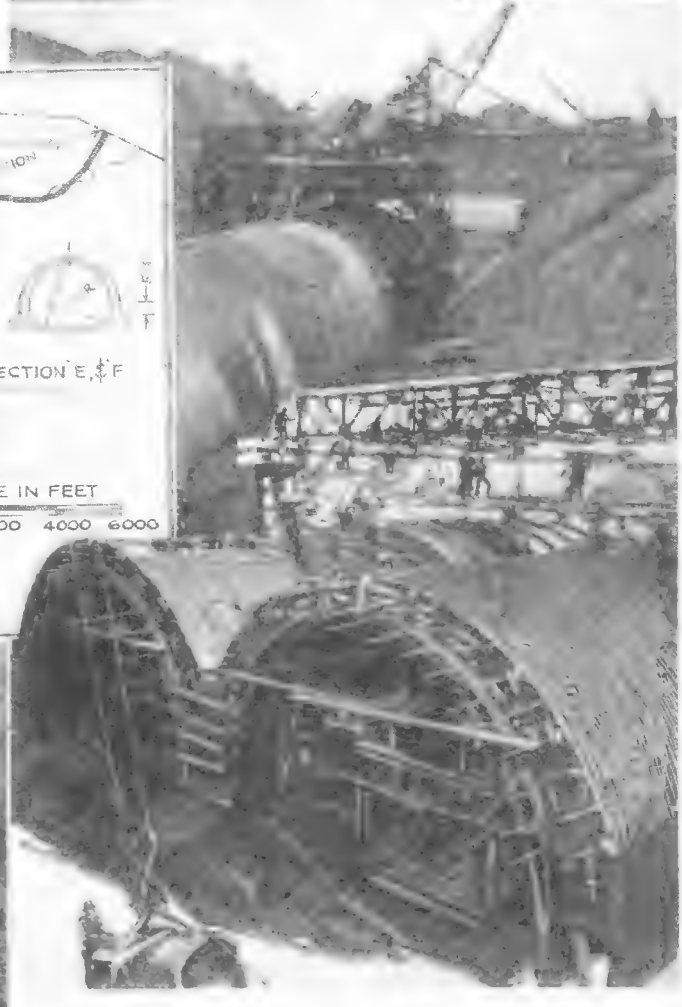


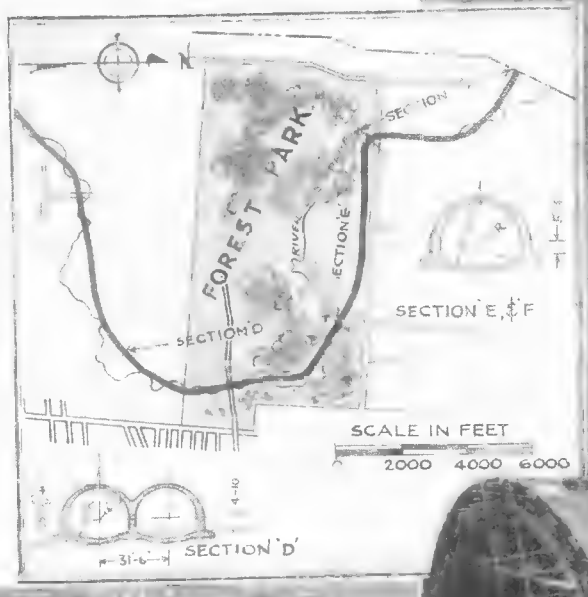
5. *Marquise de Ganay*
6. *Perle de Blanche*
7. *Rosa Carolina—swamp rose*
8. *Salett rose.*

St. Louis Buries *a* River

City Builds a One-Way Subway for the Troublesome Des Peres and Says Good-Bye to Flooded Streets Forever

By Count A. N Mirzaoff





The picture at the upper right shows what the Des Peres River looked like before St. Louis imprisoned it in steel-bound subway tubes. In Spring the stream became a roaring torrent. The map shows the route of the tube through the Forest Park district: note the old course of the river as contrasted with the "subway."

St. Louis News Service

At the left is an aerial view of the construction through Forest Park—note Section E on the map. The pictures above reveal the size of the tubes and the methods used in their construction. The length of the tunnel is thirteen miles.

WITH a giant subway St. Louis is imprisoning the River Des Peres, which heretofore has run its irregular course through the city, rampaging in the Spring of the year and serving as a catch-all for rubbish and garbage.

The Des Peres drains an area of 16,000 acres within the city limits of St. Louis, and the tunnel which will segregate it in the future is thirteen miles long. The job is costing $11,000,000. It has involved the excavation of 5,000,000 cubic yards of earth, and nearly 400,000 cubic yards of solid rock. So huge is the inside diameter of the tunnel that it will hold a two-story house without scraping.

A particularly formidable array of machinery has been brought to bear on the job of subduing the Des Peres. It has been calculated from actual results that 33 machine operators aided by 37 laborers have been able to perform the excavating work of 7,000 men working with hand tools. Eight miles of railroad track were laid for haulage purposes. The rolling stock on this road comprises a thirty-ton Diesel locomotive, two twenty-ton locomotives of the regular internal combustion type, and nine small steam locomotives.

One massive excavator which has played a leading role in the Des Peres project actually performs in 24 hours the work of 1,440 men each working a ten-hour shift. During this period it digs, carries, and dumps 8,000 tons of dirt and debris. In a single scoop, requiring ninety seconds to perform, the big shovel lifts nine tons of dirt—more than (*Continued on page* 171)

Odd *and* Unusual Patents

By Panurge

Hot Dogs

COLD FEET, decided Isaiah Williams of Gary, Indiana, are a major plague of the human race. At least in 1929 Mr. Williams went to the trouble of securing a patent on a device to banish chill from the lower extremities. It utilizes the most modern kind of heat, too—electricity; and a battery carried right behind the tendon of Achilles serves as the source of supply. The heating element itself is located under the ball of the foot.

When Three's a Crowd

IN 1929 (October 8), Harriet Ensley Hodgson came to the rescue of persons trying to get along in a one-room apartment and uphold their end of the institution of hospitality at the same time. You can't very well invite friends to stay overnight when you haven't either the space or privacy for guests. But with the aid of Inventor Hodgson's "apartment enlarger," more room and more privacy are achieved with a minimum of bother for all concerned. This boon to urban residents consists of a structure which is readily set up in any room, and when set up furnishes a second floor, suitably partitioned off from the remainder of the room, all ready for the installation of the guest furniture. To make the conception complete, the inventor included a flight of stairs and a railing, the former made of metal bent into step form. There is also included in the patent an extension for the platform.

Helps You Fly

WINGS so arranged that they simulate the rippling movement of those of a bird, ailerons so mounted that their angularity may be altered by a simple alteration of the angularity of the operator's feet, and outstanding economy in power cost—these are the features which distinguish the flying machine of Edwin Rogers, Aurora, Illinois, above all others known today. . . . Mr. Rogers patented his machine in October, 1929, and the designs accompanying his application show it adapted to the bicycle form. The main plane is just below handlebar level, and the ailerons extend from the pedals. One novel feature is the lack of a means of steering the machine in flight.

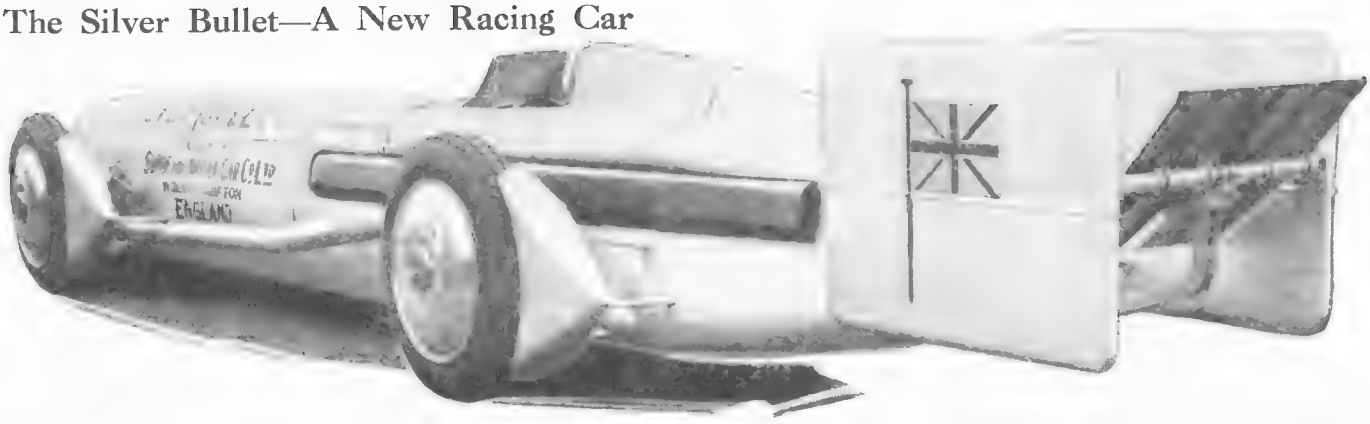
Fireman—Save that Radio!

THE Frank E. Stanley fire escape was patented in Aug., 1929, by the inventor, resident at that time in Bothwell, Washington. It comprises a large metal basket, suspended on pulleys across the wall of a building from brackets placed at the upper corners of the wall surface. Other pulleys in the scheme make it possible to maneuver the basket into position before any point on the entire wall, and so offer a means of escape, in case of fire, to all tenants having window or door openings on that side. In the picture which we have secured for illustrating the way the device works you can see how much more interesting for the fireman this form of escape would be than the relatively prosaic forms used at present.

Two-Way Protection

WHEN a car driven by a careless motorist smites the bumper of a car equipped with the Finn safety device (by Abraham Finn of Elizabeth, New Jersey), the impact does not cause the latter vehicle to turn turtle. For at the instant of contact a side member will automatically extend itself outward and furnish support for the tilting car, which a few moments later will slam its uplifted wheels to the road again. . . . The device might be considered completely successful if it did not still leave the vehicle vulnerable to impacts from either side. However, it seems to solve fifty percent of the problem—provided that cars hit from the front do turn over on their sides.

The Silver Bullet—A New Racing Car



THE Silver Bullet, latest English racing car to go after the world's speed record, is mostly all engine. It will make a trifle more than ninety miles an hour in first speed, and it must be driven along at a speed of 170 miles an hour before it can be dropped into high. There are two twelve-cylinder engines developing more than 2000 horsepower which are supposed to send the car along at a rate of 250 miles an hour. The body of the car serves also as its radiator. This is double and the water circulates through it; 500 pounds of ice are added to help keep the engine cool. Rifle sights are used to aim it, and after the four miles are used up in stopping the car, in addition to the three mile start and the one mile run, the life of the tires is ended. Segrave's champion Golden Arrow developed only 900 horsepower in comparison with the Silver Bullet's 2000. Note the two vertical stabilizers and horizontal vane.

In the Spotlight *of* Science

New Comet Discovered by Farm Boy Astronomer

FIVE years ago, L. C. Peltier, a farm boy who works in a factory at Delphos, Ohio, by day and pursues his hobby of astronomy at night in his home-made observatory, located a comet which scientists now call Peltier's Comet. In recognition of his services to astronomy, Harvard University loaned him a six-inch telescope which he set up in his observatory; and now this farm boy "has done it again." He has startled the world's star-gazing authorities by finding another new comet. After observation and calculation had convinced him that the comet he had located had not been heretofore recorded, and that astronomers who looked through the most powerful telescopes had missed it entirely, the story

of the find was relayed to the observatories and to the newspapers. Peltier is single and lives at the farm home of his parents, where he has a large library of books on astronomical subjects. In the daytime, he sweats over figures in the accounting department of a Delphos automobile factory. The photo shows Peltier standing in front of his observatory on his parents' farm.

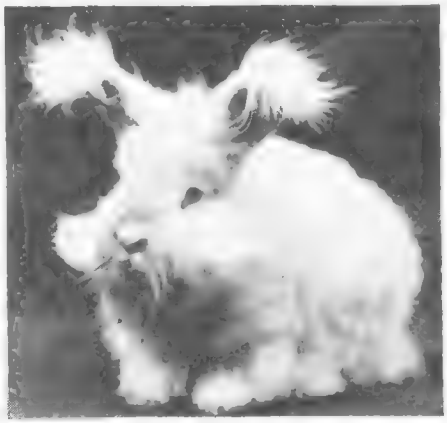
A Ray-Proof X-Ray Tube

IN the new institution for ray research of the University of Berlin, there are many laboratories for the study of the action of all important rays from the long wavelengths of the infra-red to the shortest of the gamma radium rays. The institution is equipped with complete apparatus for producing the rays and also examining them and their effects on organisms. On the first floor, in addition to the physical department and the private laboratory of the director, Dr. W. Friedrich, there is a special room for X-ray work. Direct and alternating currents are here generated and their effect on the nature of the X-rays they produce is carefully studied. In order to protect the workers as much as possible, the X-ray tube is completely covered with a shield, making it absolutely ray-proof. The shield can be opened and the entire apparatus can be rotated on its roller mounting. This room is by no means the only place in the institution where X-rays are available. There are no less than fourteen X-ray units in the institution.

Now We'll Have Rabbit Wool

FOR many years rabbit fur has been used to adorn milady's coat. This fur has been dyed, manipulated, treated, or bleached and made to resemble the more expensive furs. Animal lovers have always deplored the death of so many rabbits to appease milady's vanity.

A rabbit has now been developed which bears a plentiful crop of "rabbit wool," and the first angora wool farm has been started near Windsor, England, by Lady Rachel Byng. An angora rabbit similar to the champion here shown will supply an average of an ounce of wool per year in four clippings. The wool can be spun on even the old type of spinning wheel. The rabbit does not suffer when clipped, nor is it injured in any way. The wool that is produced is very silky and highly prized. It is possible that Lady Byng has started a new industry which may partially supplant sheep farming.



The champion buck angora rabbit of the British Isles, "Angelic Lord," is shown here. One will readily note the long silky coat and the tufted ears that are characteristic of this animal.

New Fashions in Modern Industry

HELMETS have been used by deep sea divers and in chemical warfare, but these individuals who look like Martians or sub-sea explorers are dressed in this fashion to give a new steel casting a bath. The hose held in each workman's hands does not eject water, but a stream of very fine steel shot which is sprayed against the casting at a rate of 100 pounds per minute, or three tons per hour.

At the General Electric plant, where this work is being done, castings require a complete cleaning before the paint is applied, and the workmen wear helmets not only to protect their heads from the rebounding steel bullets, but also and principally to assure themselves of a source of clean air. Washed air is supplied to the workmen the same as it would be to a diver under water. The steel shot and dust are carried off, the two are separated, and the shot is returned to the gun again, to be used over and over until it is worn down to dust.

Invisible Light Rays Used as Burglar Alarm

SCIENCE'S latest contribution to law enforcement consists of a means for protecting valuables by invisible or ultra-violet light rays. The method was demonstrated by James L. McCoy, research engineer of the Westinghouse Lamp Company, before the members of the New York section of the Illuminating Engineering Society. To show his confidence in the ability of this new discovery, Mr. McCoy placed a fifty dollar bill in the safe used in his demonstration, turned off the combination, closed the door, and then informed the audience that anyone who could get the money out of the safe without sounding the alarm, was welcome to it. The instant that the beam of light, which passes invisibly across the front of the safe is intercepted, the alarm goes off.

Vest-pocket Motion-picture Projector

A COMPLETE pocket-size motion-picture projector has been introduced in Berlin, and has become very popular there. Current is supplied by a battery that fits the pocket and will permit enough current to be drawn therefrom to light the lamp of the projector for 200 exhibitions. After this, the battery must be changed. The pictures can be projected as large as a picture frame and the novelty itself sells for but $5.00.

A New York to Bermuda Flight

PIONEERING airplane travel between New York to Bermuda, Captain Lewis Yancey, leader and navigator, and already a veteran of one trans-Atlantic flight; W. H. Alexander, pilot; and Zeh Bouck, radio operator, who by way of further information is also editor of our sister publication, *Aero News & Mechanics*, left New York at 9:37 A. M. on April 2nd, in the Pilot, a Stinson monoplane equipped with pontoons. Because of a heavy load, and a lack of wind, the ship had difficulty in taking off. The delay in starting caused the fliers to give up their attempt to reach the little island that day, and when darkness came they settled down on the sea for the night. At 5:45 the following morning the plane resumed its trip. Constant two-way radio communication was maintained between the Pilot and the New York *Times* station, except during the night. The Pilot's radio equipment was entirely of Mr. Bouck's design.

The Coldest Spot in the World

PEOPLE riding through Elizabeth, N. J., can see a spot colder than either the North or South Pole by just looking through their car windows. This is a huge store-house in which "Dry Ice" is being stored for use during the summer months. The store-house will contain about 5,000,000 pounds of the refrigerant, which has a temperature of 109° below zero. This temperature is so low that it would send even a polar bear looking for a warmer spot. Dry ice is a refrigerant made of carbon dioxide, the same gas that puts fizz in soda water. Instead of melting, it evaporates. It is much used as a means of keeping ice cream in a frozen condition after this confection is purchased in small quantities at retail. A small amount placed in a compartment next to the cream will keep it solid for hours.

Breaking Air Records

CAPTAIN Boris Sergievsky, former Russian Ace, was not content with restoring to the United States the altitude record for cargo-carrying seaplanes, but also smashed the speed record for the same class of machines. The plane used was a Hornet-powered Sikorsky amphibion. The "pay load" carried was 4,409 pounds of metal, and the altitude indicated was well over 20,000 feet. The exact height, however, will not be known until the instrument has been calibrated by the Bureau of Standards in Washington. The speed record established was 143.9 miles an hour, with the same pay load.

Glider Radio

THE first attempt to instruct a glider pilot in the air was successfully terminated at Roosevelt Field, Long Island, on March 16, 1930, when Arthur H. Lynch, editorial director of this magazine, transmitted instructions to Mrs. Alicia Patterson Simpson from a set installed in an automobile. Mrs. Simpson is a licensed pilot and a well-known author. She is the daughter of the owner of *Liberty Magazine*. The transmitter employed was similar to one described in the July, 1929, issue of RADIO NEWS. Its source of power was 180 volts of "B" batteries, and the car battery was used for filament supply. The car acted as a counterpoise, and the antenna led to a ten-foot pole mounted in the back of the car

The receiver is shown attached to the upright in back of the pilot and comprises a set using three 199 tubes, two 22½-volt "B" batteries for plate supply and two 4½ volt "Cs" connected in parallel for the filaments. The receiver was designed by John B. Brennan, Managing Editor of RADIO NEWS, and will be described in the current issue of that publication. A wire tacked along the leading wing edges of the glider was used as an antenna in addition to a trailing antenna, and the guy wires of the plane served as a counterpoise.

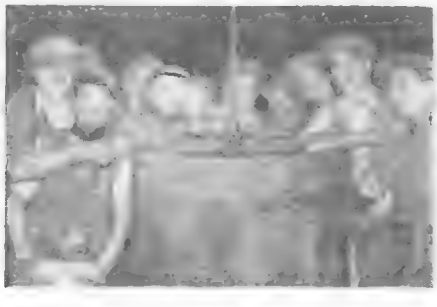
Aero Speed Boat to Break Records

ONE of the strangest craft that ever took the water was launched on February 24, at Quincy, Mass. This vessel has a speedboat hull and is equipped with a pair of wings that have a 48-foot spread. The vessel was built for Paul K. Dudley, of Fitchburg, Mass., who designed it for the purpose of breaking all speed records on the water. The boat is equipped with two 450-horsepower Liberty motors, and four bladed airplane propellers are used instead of the under-water types. The wings have a lifting power of sixteen tons and are expected to enable the boat to skim the surface at a speed far higher than that of other water craft.

The motors of the Silver Eagle, as this vessel has been called, are mounted on the wings, and the control mechanism is similar in all respects to that of an airplane, even to the rudders. A glass-enclosed mahogany cabin protects the crew and passengers from the elements and insures their comfort. The vessel is capable of seating 25 persons and is fully equipped.

A Submarine Photograph

THE atmosphere is very foggy at a depth of thirty feet below the Thames riverbed where workmen are preparing a foundation for a new bridge. They work in a caisson, compressed air being supplied to them. The photographer who took this picture had to pass a special examination before he could enter the chamber.



Plane Takes Off in a Forest

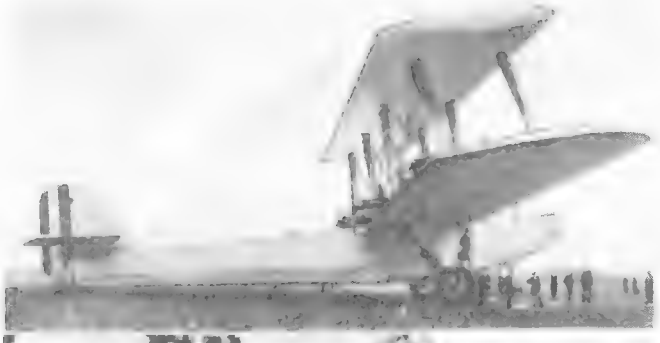
ONE of the most thrilling airplane take-offs that has ever been performed was accomplished recently by Captain Charles Kingsford-Smith, the Australian who flew from the United States to Australia in 1928. Recently, when one of the planes of a commercial fleet made a forced landing in a forest near Bornaldo, New South Wales, it seemed to everyone that the ship would have to be dismantled before it could be removed. Captain Smith hit upon another idea. He tied the plane's tail to a tree and set the engines going full speed. When the machine lifted from the ground and strained at its leash, a farmer was signaled to cut the rope with an axe. In a flash, the plane was away. It barely cleared the tree tops, but Captain Smith brought it safely home.

Talkie Films to Aid Medicos

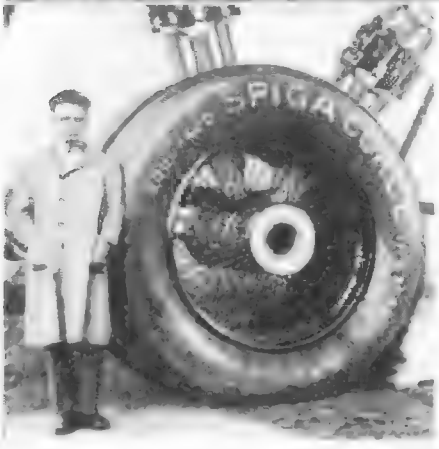
MEDICAL students may soon receive their instructions in the form of talking motion picture lectures, if one can judge by the reaction obtained to the first talking film to be used by the College of Physicians and Surgeons of Columbia University in New York. This film shows the reduction and splinting of a Potts fracture, a fracture of the fibula with an outward, backward displacement of the foot. While the physician's voice was heard explaining the diagnosis and procedure, the film showed the method of pulling, straightening and splinting.

Invisible Light Detects Counterfeits

PRODUCTS put under the ultra-violet ray lamp from which the visible rays have been filtered by a specially prepared glass, will reveal any spurious elements they contain. Dr. Herman Goodman showed that spurious and forged documents and legal papers, counterfeit currency, and the like, would immediately reveal their defects, and that even a single speck of dust dropped into a pitcher of pure water would disturb the color of the entire contents when examined under this black light. Bootleg liquor and spurious jewelry also show color differences.



The new Caproni airplane shown here is the largest in the world, being even larger than the famous German flying boat DOX. Compare its size with the men.



World's Largest Airplane

THIS gigantic Italian airplane, the Caproni 6000, was photographed after a successful test flight. While built primarily for military purposes, with special arrangements it can be fitted for long distance passenger service. The machine is all steel and equipped with six engines of 1,000-horsepower each. It is 36 feet high and has a wing span of 114.8 feet. The ship can attain a speed of 130 miles an hour, and it was designed by the famous Italian engineer, Gianini Caproni. Compare size of mechanic and one of the double wheels.

Science Explodes Another Myth

THE familiar idea that every living cell in the human body wears out and is replaced by another every seven years has no scientific support. In a series of calculations, reported in the *Quarterly Review of Biology*, Dr. Edward F. Adolph of the University of Rochester demonstrates that some cells in the body may last for life. Various elements in the body are subject to a more or less constant change, but the rate of change differs with the different elements. For example, water is changed on an average of every three weeks; salt, every 22 days; potassium, an element believed to act as a regulator of the activity of many kinds of living cells, on an average is turned over about every 72 days. Magnesium, which is believed to act in the regulation of vital activities, is changed every 103 days; nitrogen, a fundamental element in muscles, is turned over on an average of 290 days; iron, an essential of the blood, in about 300 days; and phosphorus and lime, both found in the bones, change less rapidly. About 800 days are required for the former, and 2,300 days for the latter.

Flying Boat Type Glider

A FLYING boat type of glider with an open cockpit has been successfully launched and flown from the waters of Manhasset Bay, Port Washington, L. I., by Richard M. Atwater, one of the country's leading air pilots and glider enthusiasts. His first experiments with the glider consisted of three successful take-offs when towed by an airplane. Later, a fast speed boat was used to effect the take-off and flight. After 46 seconds of towing, the tiny monoplane lifted clear of the water and with only about 50 feet of altitude, maintained its flight for a minute.—*Paul S. Jainchill.*

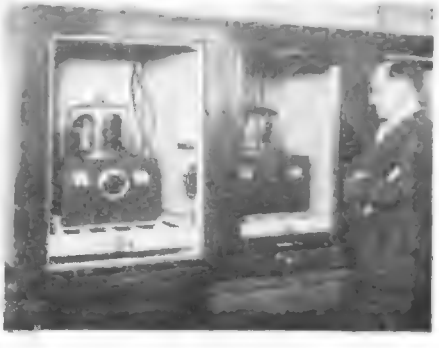
Above: How the sea glider appears on land, and at the left, how it rides the water just before the take-off.

Invisible Eye-glasses

CONTACT eye-glasses that are worn directly on the eye-ball, and that do not interfere with the closing of the eye-lids, have been invented by Privy Councillor Professor Dr. L. Heine, of the University of Kiel. By this invention, the scientist expects to revolutionize ophthalmology. He believes that spectacles and eye-glasses will become superfluous. The thin curved glass is inserted by the patient himself and is practically invisible. Only when viewed from an angle, can the glass be seen. The photograph shows the inventor wearing these eye-glasses, and at the lower left some of the contact glasses for near- and far-sightedness are shown. When the glass is moistened with a lubricating solution, no pain or discomfort is felt by the wearer. The inventor has not yet informed us what would happen should the wearer of this type of glass be accidentally struck a blow in the eye.

Radio Yardstick

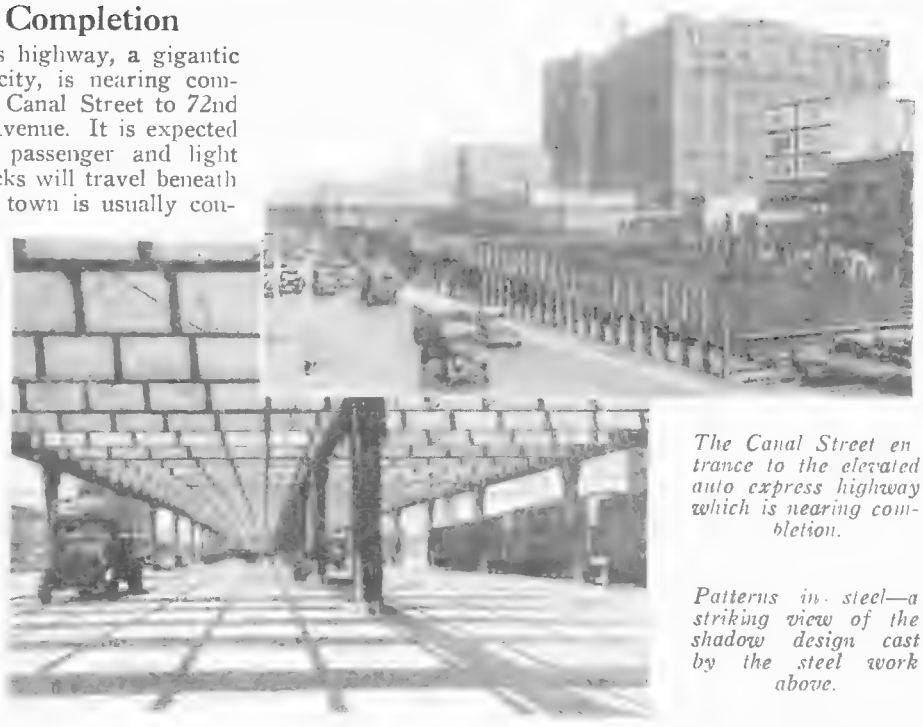
A NEW apparatus which might appropriately be termed a radio yardstick has been designed and installed in the radio laboratory of the Bureau of Standards. This apparatus is perhaps the most precise wave meter ever constructed, and it will be used to measure the wavelengths of the 600 broadcasting stations and thousands of other transmitting stations in the United States. Dr. J. H. Dellinger, Chief of the Radio Laboratory, is shown standing beside a portion of the apparatus.



Elevated Highway Nears Completion

NEW YORK'S elevated auto express highway, a gigantic project on the west side of the city, is nearing completion. This highway will extend from Canal Street to 72nd Street, along West Street and Twelfth Avenue. It is expected to relieve traffic congestion and allow passenger and light cars to speed along the top, while the trucks will travel beneath the elevated structure. This part of the town is usually congested because of the immense amount of shipping transfer that takes place here. The ramp shown in the upper photograph is the start of the incline to the elevated highway located at Canal Street.

The structure is of steel and will be appropriately paved with an approved form of block, so as to minimize the danger of skidding. There being no cross-overs on the highway, it will be possible for an automobile to start at Canal Street and continue, without stopping, to the 72nd Street entrance. This will enable cars to escape the most congested portions of the city, where they may sometimes be tied up for periods as long as an hour. Beneath the elevated structure the trucks will be able to load.



The Canal Street entrance to the elevated auto express highway which is nearing completion.

Patterns in steel—a striking view of the shadow design cast by the steel work above.

Builds Plane for $85, Then Flies It

AN aviation enthusiast of Abingdon, England, decided to avail himself of the opportunity of obtaining parts from the Royal Air Force Disposal Depots and proceeded to build an airplane. The cost of all the equipment was $85. After the vessel was completed, Stanley Buckell, the builder, took it to the Air Ministry and passed the rigorous tests specified, coming out with flying colors. The photograph shows the plane actually in the air. The picture was taken at the time of the Air Ministry tests.

Perhaps some of our American aviation enthusiasts will follow the example set by this English youth and duplicate his feat.

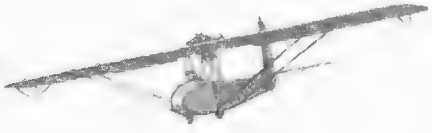
Talkies of Confessions

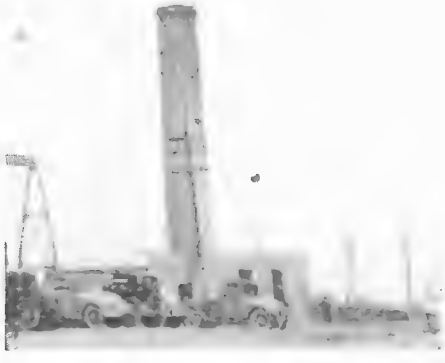
JUDGE JAMES GORDON, Jr., of Pennsylvania, has ruled in Quarter Sessions Court that talking motion pictures can be used as legal evidence in trials. The court held that the novelty of motion pictures is no reason for rejecting the evidence presented by a film, and that courts have always been hospitable to inventions or discoveries of science when their accuracy and reliability as aids in the determination of truth were established. The judge declared that inasmuch as photography and the reproduction of sound were both admissible, there was no reason to reject the combination of the two. Said the court: "Its very impressiveness would give it an inherent weight that its accuracy would justify and, in our judgment, it would go far, in the case of the photographing of confessions to negate the contention, so often falsely made, that a confession was secured by force and coercion, or disclose circumstances indicating the presence of such impropriety."

Director of Public Safety Schofield said that this decision established a precedent which would open the way for making talking pictures a part of the police work in Philadelphia. A jury convicted a man of theft after viewing a talkie confession.

Combining Power Plant with Glider

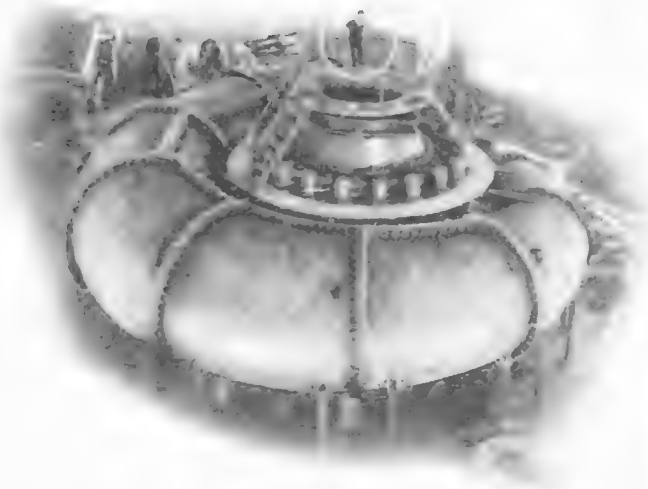
A COMBINATION of a glider and power plant, embodying the construction principles of the glider, with the addition of a motor for propulsion, was successfully introduced to the world of aeronautics at the Dayton Airport, Ohio. The ship, designed expressly for sport flying, was created by Orval Snyder and E. A. Johnson. It has a weight of 467 pounds, and will carry a useful load of 340 pounds including two passengers, six gallons of fuel, and a half-gallon of oil. The wing spread is 35 feet, the cruising range 240 miles, the top speed 85 miles, and the cruising speed sixty miles. The power glider can take off on a runway of less than 100 feet, and lands at a speed of 25 miles an hour.





Sensitive Poison Gas Detector

WILLIAM H. PRITCHARD, a nineteen-year-old youth employed in the department of physiology at the Middlesex Hospital, Middlesex, England, has recently perfected an apparatus which is expected to banish the danger of gas explosions in mines or submarines. This device is so sensitive that it will detect five parts of carbon monoxide or other gas in 10,000 parts of air. When ordinary air passes through the machine, a green light glows. A red light means danger.



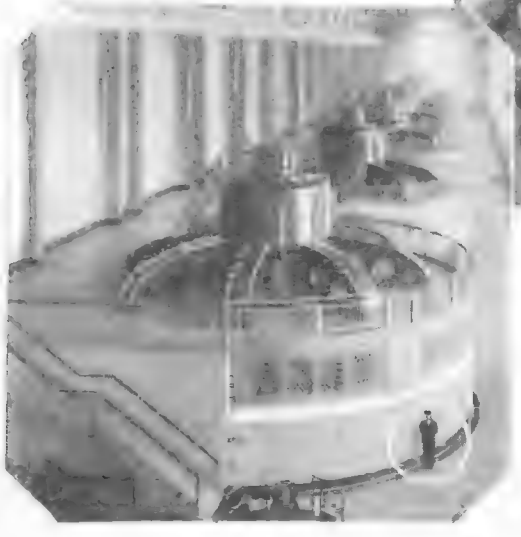
Philadelphia—
a Scientific Glimpse

Aero Service Corporation

In its Philadelphia plant the Westinghouse company builds giant steam turbines like the one shown above. Note size of workman.

Philadelphia is the headquarters of the Pennsylvania Railroad. The picture above shows the great coal piers being constructed by the Pennsylvania system at Port Richmond, on the Delaware River.

The elevated tracks of the Pennsylvania Railroad are being eliminated in favor of a tunnel into the heart of Philadelphia. The immense extent of the project is indicated in the photograph reproduced above. Below is shown the Pennsylvania approach to the Tacony-Palmyra bridge which spans the Delaware above Philadelphia.



In the turbine hall of the Philadelphia Electric Company at Port Richmond, two steam turbo-generator units develop 120,000 k. w. At the left is pictured the turbine room of the company's Conowingo plant, costing $52,000,000, where seven 54,000-k.w. hydro-electric units supply the Philadelphia territory. Note size of workman.

Aero Service Corporation

First National Pictures, Inc.

Tom Dick *and* Harry *Psychologists*

The Professors Could Learn Some Original Slants on Human Nature from Cafeteria Managers, Merchants, Razor Grinders. . . . Probably You Could Give Them a Few Pertinent Pointers Yourself

By Edward J. Beck

MY friend, the photographer, was up against a funny problem. It was just the reverse of the vexing situation that has kept countless fathers and mothers pacing the floor in perplexity—at ungodly hours. For them, at least, there were suggestions that might be tried out; the photographer would have found no help in the books of his craft even if he had turned to them.

His problem was: "How can I make a baby cry when it does not feel like it?"

"We ought to have at least one pose of the baby crying," some of his patrons thought. "He's just too cute for words when he cries."

When I talked to the photographer, he had discovered such a system and had it down pat. Simple and painless, too. Babies cried for him just as they do for the stuff advertised on the sides of barns. All he had to do was to hold the baby's hands together and nature took care of the rest. An instinctive resentment against restraint made the baby perform as desired.

"Knot-Hole Vistas"

ONE of my hobbies for the past ten years has been to collect these flashes of insight, these knot-hole vistas, just as other people collect stamps or bugs. The sharply focused observations of Professors Tom, Dick and Harry in the field of psychology overflowed from one note-book into another. Gradually, the collection of data or specimens grew to the bulk of an encyclopedia of shirt-sleeve psychology.

Now I can start at "A" and call the roll of various trades and professions and find spokesmen of many different callings on record with shrewd observations.

Color in Cars

THE automobile executive gets the floor first with a recent entry. He and his company, he said, were wondering what colors of cars would be likely to make a hit out on the drab sand plains of the west and southwest, where the company had not been getting its share of the business.

Some of the bright boys around the office thought they knew. People who live in such a monotonous environment, they theorized, are famished with a sort of color-starvation. Naturally, they would jump at a chance to make up for this deprivation by buying vivid-hued cars.

Bigelow Sanford Carpet Co., Inc.

It took a rug salesman to discover that Californians saw so many real flowers that they didn't care for woven ones.

"I had a survey made," disclosed the executive, "because I have learned to distrust swivel-chair conclusions. It turned out that my associates in the office were all wrong.

"The report showed that people who live in a drab country want drab cars. Black and blue without any punch suited them best. In other words, they wanted what they were used to and not what they didn't have. Habit, and not suppressed desires, was what counted. The familiar was preferred."

Rugs and Candies

IT seems that you can't theorize about matters of taste. Even that principle of the familiar-is-wanted, just mentioned, doesn't always work out. A rug salesman who covered the whole country, remarked that floral patterns went pretty well in every state except one. That was California. Out there, he said, people are fed up with real flowers; they don't want any woven ones.

Did you ever buy candy put up in a green box?

The chances (*Continued on page*

Flower Odors from Flasks

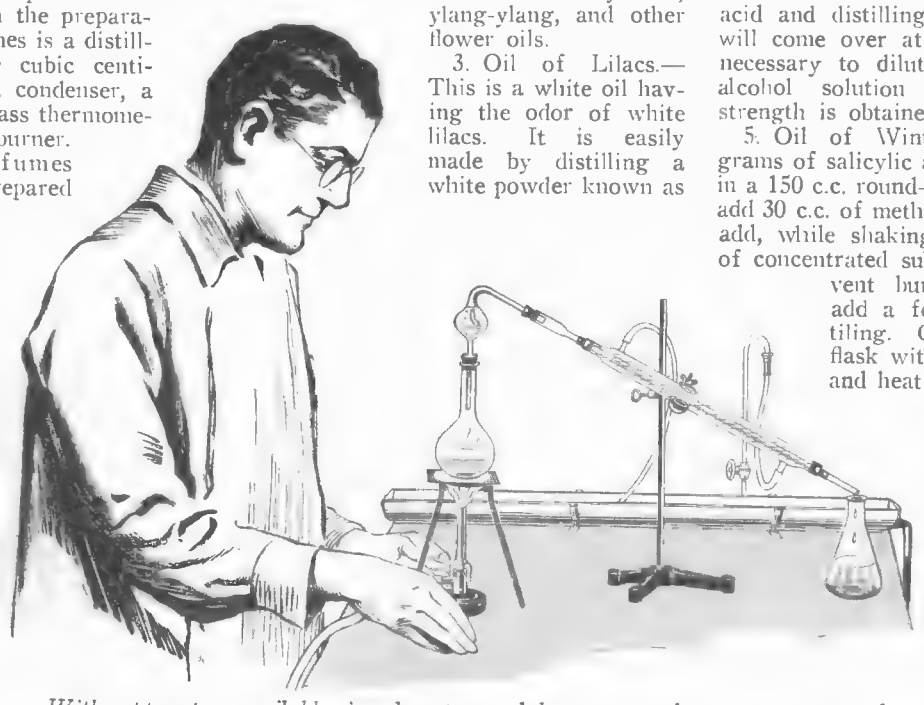
By Robert E. Sadtler
First Lieutenant, U. S. A.

Here are the seven perfumes you can synthesize in the home laboratory:
Oil of Apple-Blossoms
Oil of Jasmine
Oil of Lilacs
Oil of Neroli
Oil of Wintergreen
Orange Flower
Oil of Narcissus

THERE are seven synthetic perfumes which can be made by the amateur chemist in his home laboratory at little expense. The apparatus needed in the preparation of these perfumes is a distilling flask (150-500 cubic centimeters capacity), a condenser, a receiving flask, a glass thermometer and a Bunsen burner.

The seven perfumes which may be prepared are:

1. Artificial Oil of Apple-blossoms or Ethyl Acetate.
2. Oil of Jasmine or Benzyl Acetate.
3. Oil of Lilacs or Terpineol.
4. Oil of Neroli or Methyl Anthranilate.
5. Oil of Wintergreen or Methyl Salicylate.
6. Bromelia or orange-flower perfume.
7. Oil of Narcissus or Phenylacetic aldehyde.



With apparatus available in almost any laboratory and an assortment of easily obtained chemicals, you can make seven synthetic perfumes.

1. Artificial Oil of Apple-blossoms.—Place fifty cubic centimeters of concentrated sulfuric acid in a distilling flask and add fifty cubic centimeters of absolute alcohol. Heat the mixture until the temperature reaches 130-140°C., and then slowly add through a separatory funnel a mixture of thirty cubic centimeters of absolute alcohol and thirty cubic centimeters of glacial acetic acid.

It is then necessary to separate the crude acetic ether from the water and to wash it with caustic soda solution. Water may be removed by shaking the solution with fused calcium chloride and heating the mixture in a distilling flask. The artificial oil of apple-blossoms distills over at 77-80°C. It may be diluted with alcohol until a solution of the desired concentration is obtained.

2. Oil of Jasmine.—A mixture of 54½ c.c. of benzyl alcohol (obtained by the action of potassium hydroxide on benzaldehyde and subsequent distillation), 30.2 c.c. of glacial acetic acid, and 5 c.c. of concentrated sulfuric acid is placed in the distilling flask and heated to the boiling point. At about 215°C., a sweet smelling oil will distill over and collect in the receiving flask. This oil is a natural constituent of oils of jasmin, ylang-ylang, and other flower oils.

3. Oil of Lilacs.—This is a white oil having the odor of white lilacs. It is easily made by distilling a white powder known as terpin hydrate with sulfuric acid and water. The oil obtained in this manner is very concentrated and should be diluted with alcohol before using. It is used extensively in toilet-water.

4. Oil of Neroli.—This is a yellowish oil having an intense blue fluorescence, and possessing the characteristic odor of neroli. It is prepared by placing sixty parts of anthranilic acid and sixteen parts of methyl alcohol (poison) in a flask with concentrated sulfuric acid and distilling. The oil of neroli will come over at about 125°C. It is necessary to dilute this oil with the alcohol solution until the desired strength is obtained.

5. Oil of Wintergreen.—About 17 grams of salicylic acid should be placed in a 150 c.c. round-bottomed flask. Then add 30 c.c. of methyl alcohol and slowly add, while shaking the flask, 4½ c.c. of concentrated sulfuric acid. To prevent bumping in the flask, add a few pieces of porous tiling. Connect the distilling flask with a reflux condenser and heat on a steam-bath for 2½ hours. The oil of wintergreen formed usually stays at the bottom of the flask during this reaction. Distill off the methyl alcohol, transfer the residue to a separatory funnel, add about 50 c.c. of water, shake, separate the lower layer which is the oil of wintergreen, and wash it in the separatory funnel, first with water and then with dilute sodium carbonate solution to neutralize any traces of acid. The oil of wintergreen should then be separated from the water and purified by distillation. The oil of wintergreen should distill over at 224°C.

6. Bromelia or Orange-flower Perfume.—This is the ethyl ether of beta naphthol. It is prepared by placing 10 grams of beta naphthol in a 250 c.c. distilling flask connected with a reflux condenser. Now mix fifteen cubic centimeters of ethyl alcohol (95% or absolute) with four cubic centimeters of concentrated sulfuric acid and pour this over the powder. This mixture should be boiled for a quarter of an hour, keeping the condenser well cooled. A creamy colored mass will remain when this mixture has been cooled and this mass should be washed several times, first with distilled water, and then with weak alcohol to remove all traces of acid. The perfume formed has a very powerful odor and it should be diluted (*Continued on page* 183)

Two New Contests

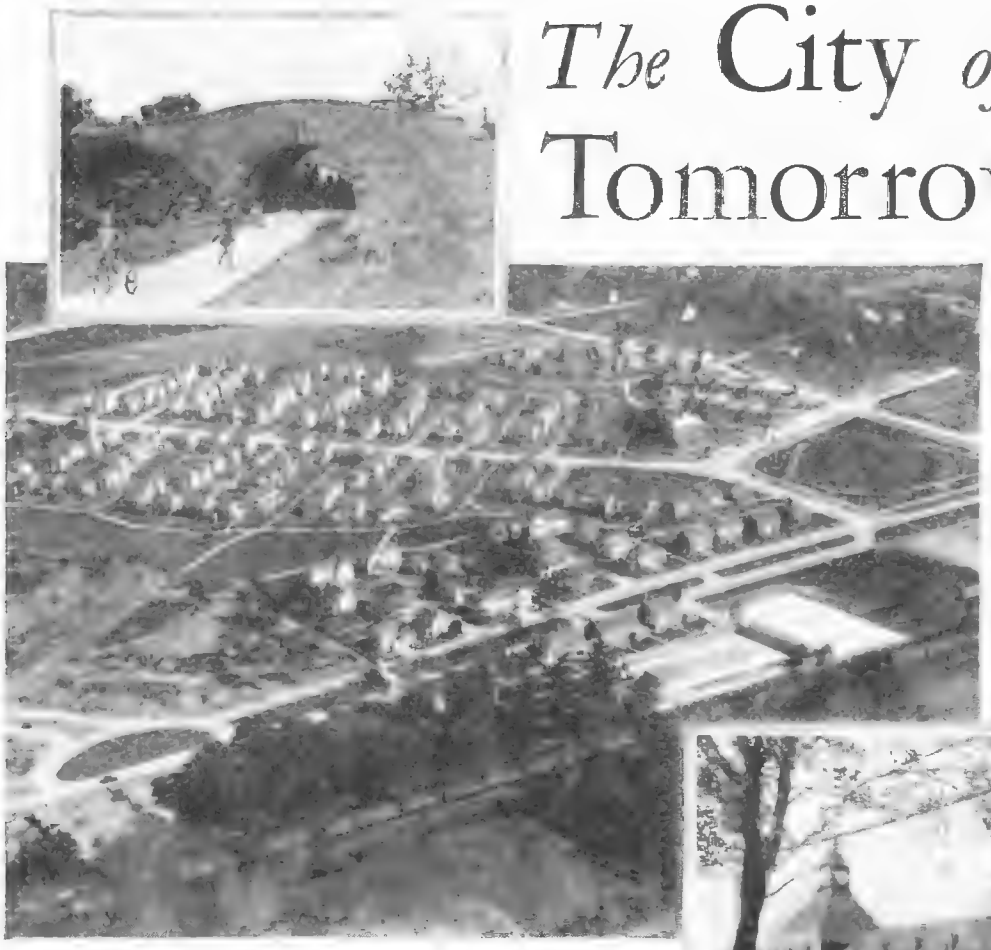
No. 1—$15.00 in Prizes for Home Workshop Photographs.

No. 2—$55.00 in Prizes for Photographs and Detail Drawings of Things you can make.

EVERY MONTH

Rules on Page 153

The City *of* Tomorrow-*Today*



By Don Bennett

Perhaps for the First Time a Town Has Been Built from the Ground Up, by Modern Production Methods, for the Motor Age. Read About It Here

The broad, white lines are motorways; the thin ones are walks connecting the homes of each super-block with each other. Pedestrian and motor traffic are completely separated. Super-blocks are connected by pedestrian underpasses. All homes face a central park space and have motor entrances at the rear. The picture below was shot from a Radburn front veranda. Note that no streets are in sight, but only the walk system connecting the homes.

This general shopping center enables Radburn folks to do their shopping at one place. The wide area separating it from the street serves as a parking space and keeps the street free of standing cars.

WHEN man's home was truly his castle, in that era before he banded together with his neighbor and built his town, roads ran from place to place, ambling over the countryside in an effort to pass close to everyone's house. Then by chance or design a house was built at a crossroads, became a tavern, and formed a focus for the community life of the agriculturists dwelling nearby. Later a smith built his home and shop on one of the other corners, and from time to time other persons of the commercial clans built and occupied parcels adjacent.

"Short cuts" came into existence to obviate the necessity of going clear to the corner to reach one of the other roads. Time and use wore it into a footpath, widened it, made it a road. The process was repeated until the village grew through many streets into a town, a city.

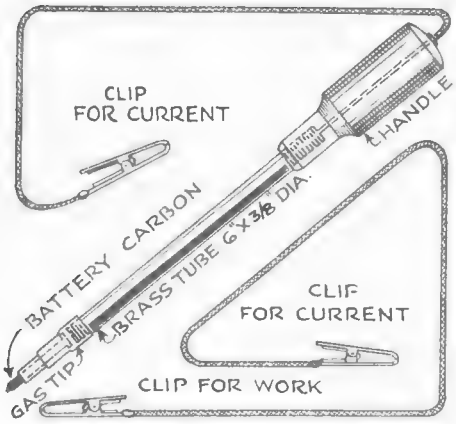
Science entered. Engineers laid out new sections in geometrical patterns all of intersecting straight lines. Streets were thoroughfares for vehicular traffic, with safety zones for pedestrians along the edges. But at an intersection the safety zone had to be deserted until the traveler conducted himself to the other side. Eight, ten, sixteen times in a mile you looked to right, to left, then scurried across before the juggernaut could overtake you. Children overflowed the yards and sidewalks and played in the area set aside for traffic, accidents, mostly unavoidable, took place. New towns were laid out, still with streets flanked by sidewalks, intersecting each other in checkerboard fashion.

Now a new era appears—embodied in a New Jersey town planned and built for the motor age. A departure from the checkerboard type of street pattern; complete divorce of the pedestrian area from the vehicular; play places removed from the dangers of traffic. No pedestrian and vehicular intersections. No more back and front doors—the motor entrance and the garden entrance, instead.

This new town—Radburn is its name—is based on the "super-block" plan. A central area of park space is devoted entirely to foot traffic and play. Along its (*Continued on page* 163)

Flashes *from the*

You'll Find Many Valuable Suggestions for

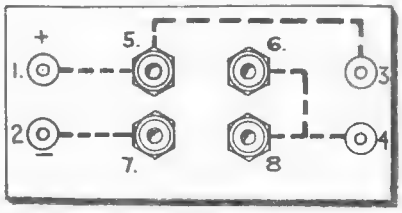


Make Your Own Electric Soldering Iron

IF you do any amount of work on your radio, you are sure to need a good soldering iron. Here are the directions for making a low voltage electric soldering iron which will work on storage batteries of four, six, or twelve volts, and may even be used on a small transformer. You will need the following material: one screw-driver handle, a piece of brass tubing (⅜-inch in diameter by 6 inches long), three clips, two gas tips, some flashlight carbons, and a single strand of lamp cord about five feet long.

Bore a hole through the screw-driver handle, 2 inches deep and ⅜-inch in diameter. Then drill a hole through the remainder of the handle, 3/16-inch in diameter. Thread the brass tube at one end so the gas tip can screw right on it. Solder one end of the lamp cord into the end of the tube not threaded. Pass the lamp cord through the wide opening of the handle and pull through the narrow hole. Leave the brass caps on the battery carbons. Rub the other end back and forth on a file until the desired shape is obtained. Solder one clip to lamp cord and the other two clips to another piece of lamp cord about two feet long.

To operate the iron, connect one wire to current supply and the other to the object to be soldered. It is, of course necessary to insert the carbon tip in the end of the iron before beginning work.—*Bernard F. Ring.*



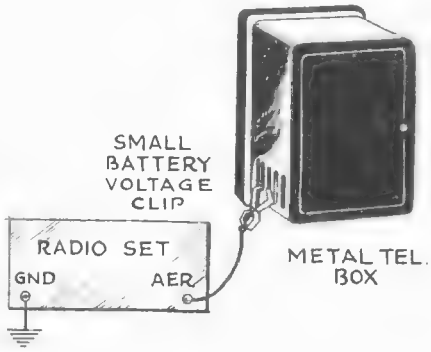
Testing Unknown Resistances

MAKE a hard rubber panel three inches by six. Four binding posts on numbers one, two, three, four; four tip jacks on numbers five, six, seven, eight. Connect source of voltage to one and two, voltmeter to five and six, ammeter to seven and eight. Unknown resistance equals reading of voltmeter divided by reading of ammeter.—*W. C. Shuster.*

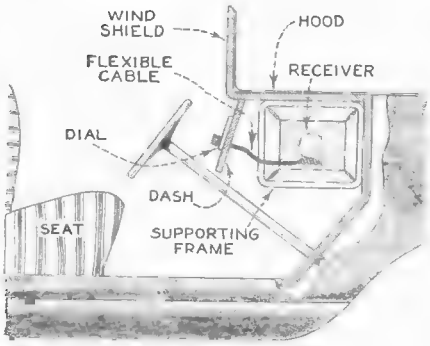
Telephone Box Antenna

A METAL telephone box used as an antenna, will, in many cases, produce as much volume as any indoor aerial, and in addition will give the added advantage of selectivity. It is only necessary to run a wire from the antenna post of the set to the telephone box. A clip may be soldered on to the end of the wire so that it will clip into the vents of the box. This is the most convenient arrangement. The antenna may be disconnected at a moment's notice.

This method is especially recommended for city dwellers, who, ordinarily, have much difficulty in finding space on the roof for the erection of an aerial. It is not against the fire underwriters' regulations.—*Arthur A. Hroch.*

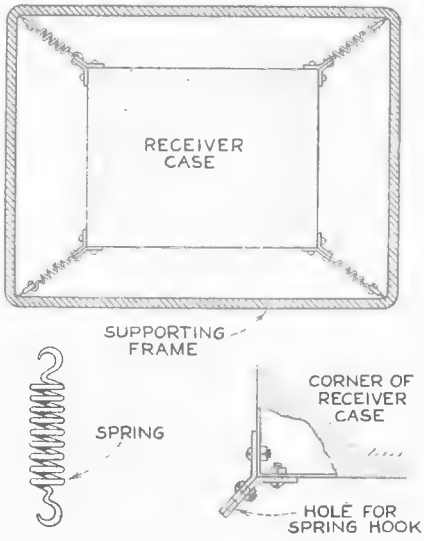


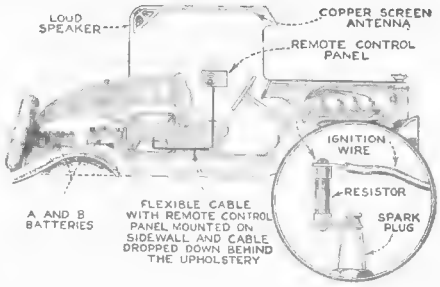
Automobile Radio—How to Install It—How to Operate It Successfully



NOW that the public is flocking to buy radios for their automobiles, a few comments on installation and suggestions for the prevention of noisy reception might be timely. The most important thing in the matter of noiseless reception is the shielding of the ignition system. One method is to insert resistors in series with the spark plugs, and one in series with the central contact on the distributor. Another way of obviating ignition trouble is to completely shield the spark plugs and the use of cables in metallic housings.

The placing of the receiver in the car will depend on convenience to the driver, and accessibility for repairing. In a coupé or roadster, the logical place for the set would be in the compartment occupied by the rumble seat. In the sedan or touring car having an unusually long hood, ample space for locating the receiver will be found directly forward of the dash, under the hood. There still remains such places as may be found under the floor boards, under the seat, or even in a metal box strapped to the running-board.




LOUD SPEAKER
COPPER SCREEN ANTENNA
REMOTE CONTROL PANEL
IGNITION WIRE
RESISTOR
SPARK PLUG
A AND B BATTERIES
FLEXIBLE CABLE WITH REMOTE CONTROL PANEL MOUNTED ON SIDEWALL AND CABLE DROPPED DOWN BEHIND THE UPHOLSTERY

The tuning controls may be located on the dash, on the steering-wheel shaft, or on the side door, next to the driver. If the set is not right at hand, the tuning control may be connected by means of a flexible shaft, such as may be obtained from dental supply houses, to the condenser bank. The antenna finds the roof of the car its most favored resting place.

The receiver should be insulated in some manner to obviate unnecessary vibration. Springs attached to the receiver holders, or rubber straps will take care of this item.

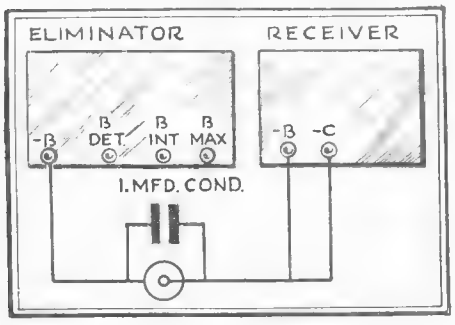
Radio Lab

the Betterment of Your Set on these Pages

Grid Potential from the "B" Supply

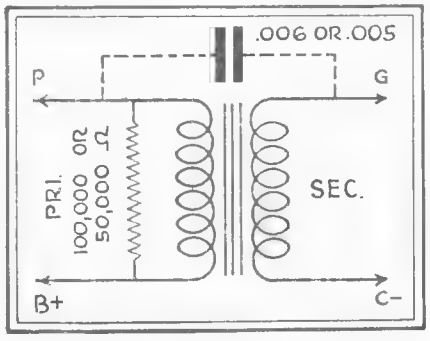
ONE of the most important factors in the correct functioning of the radio set is that of proper regulation of the grid-potential, better known as "C" biasing. If this is not properly taken care of, the tubes will clog up and the set will interrupt. The "C" bias from the "B" eliminator may be obtained very easily by connecting a clarostat in series with the "B" negative, and shunting a one microfarad condenser around it. The grid potential may be regulated very easily in this manner.

Using such a method as is outlined here, one will have no need of a "C" battery and all the attendant difficulties, such as the inefficiency of cheap batteries and the constant need of replacement.—*Arthur A. Hroch.*

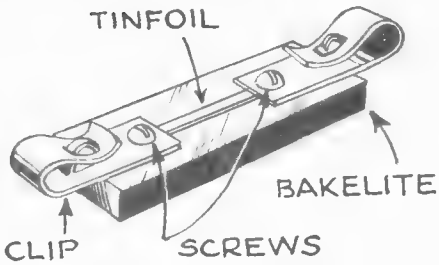


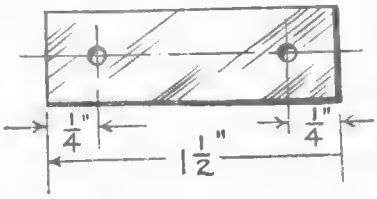
Reviving Burnt-out Transformers

DURING my work as a serviceman, I have found that many people insist on having transformers replaced with the same brand they have been



using. This is in many cases impossible; the firm having gone out of business. I have found the following scheme very helpful. If the primary has burnt out, use a leak of 1/20 to 1/10 megohm across it. If the secondary has gone west, shunt a ¼ to ½ megohm leak across it. This is done by clipping the leak to the old terminals. The blocking condenser may be placed anywhere between the plate and grid of the following tube. This improves the quality as well as the volume.—*William B. Woodward.*

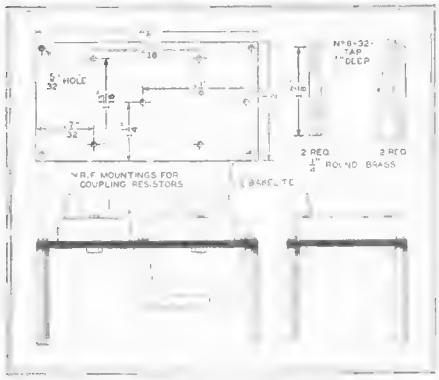


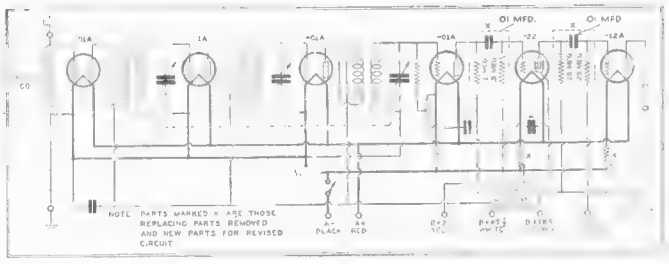


Emergency Fuse for Radio

IF you've ever had trouble with short circuits in your radio set, this novel idea should please you very much. Cut a piece of bakelite 1½ inches long and ½-inch wide. Drill a hole ¼-inch in diameter, at each end. Then screw two Fahnestock clips on the bakelite strip. These may be secured with short machine screws, tightened by nuts on the bottom. Lugs may be used instead of clips, if such is desired. For the fuse wire, cut a small strip of thin tin foil. Loosen the nuts and insert the strip of foil under the two clips or lugs. Then tighten up the nuts, and you will have a fuse that will prove satisfactory to any experimenter. This has proved of much value in my own work. It has proved to be very sensitive to the slightest overloading. The same idea may also be used as an emergency fuse in the meter box of the house lighting system.—*Bernard T. Ring.*

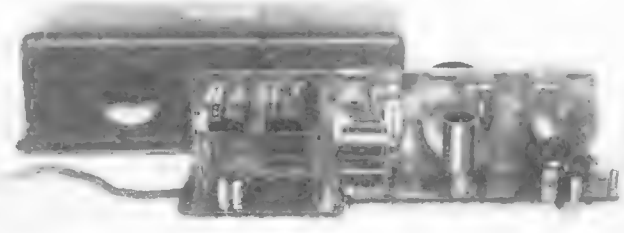
Revamp Your Old Radio Set for Automobile Use When Touring or Camping





FROM the technical laboratory of RADIO NEWS comes the word that they have successfully revamped an antedated Atwater Kent model 35, changing the outmoded audio system so that good reception for automobile use is obtained. This set, purchased on the open market for $8.95, is a six-tube, battery-type job, using the first tube for coupling between the antenna and the two tuned r.f. stages. Two transformer coupled audio stages, of an ancient vintage, follow a tuned, non-regenerative detector.

The old audio transformers were clipped out and replaced by a first stage of screen-grid resistance coupled audio, and the second stage of resistance coupling, using a -12 type tube. The use of a -22 tube with 135 volts on the plate and 22½ volts positive bias on the screen-grid, necessitated the employment of separate filament resistors for the detector and audio tubes. The detector and final audio stage use four ohm resistors in their positive filament legs. A 20 ohm resistor cuts down the six volts to the needed three and 3/10 volts for the screen-grid tube. The wiring follows the diagram shown in this article. The parts marked "X" are those to be removed. You will notice that the constants for the various new parts are mentioned right on the diagram.



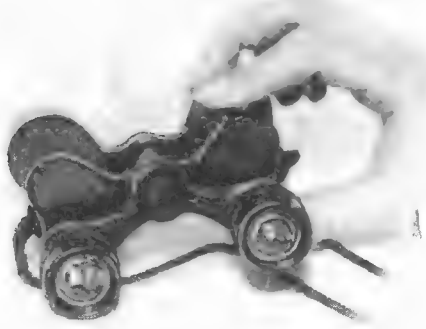
The changes in this AK 35 receiver, which are recommended for automobile use, may be employed in other compact receivers. Other changes which might be experimented with are the change to screen-grid tubes in the r.f. stages, and the use of a -27 tube or -22 tube as a power detector.

Scientific Aids *to Your* Comfort

By Ethel J. Bein

Take a Smoke While Driving!

GROPING through your pockets for cigarettes is out as an excuse for careless driving . . . as is wondering just where to strike a match. Now you can keep both cigarettes and matches at your finger tips. Here's the latest cigarette case installed on the gear shift in place of a knob. It looks like a regular knob, too—but just twist off the cap, take a cigarette, return the cap, and strike your match on its top. All without shifting your view!

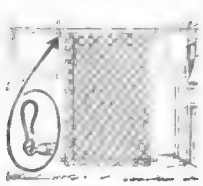


Baby Binoculars

DO you want a powerful pair of field glasses, small enough to be kept in your knapsack or coat pocket? A pair that weighs eight ounces, and can be used equally well for opera and bird study? These baby binoculars are equipped with objective tubes extending beyond the lenses to shield eyes from sun glare. They have a view of 150 yards at 1,000 yards distance.

A Pinless Curtain Frame

THERE'S no use tearing your curtains and scratching fingers while pinning them to a frame, say the makers of a new drying device, constructed of water-proof enameled steel rods.



For stretching heavy materials there are extra weights for the lower rod. Hooks enable you to attach the set to a clothes-line or wall.

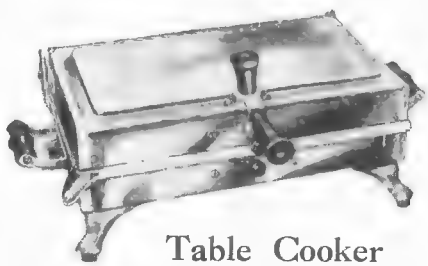


Table Cooker

HOW would you like a ten-by-seven-inch grid table cooker that could toast two full sized sandwiches at the same time? That is the claim made for a new one now on the market. It is said to cook steaks and chops effectively. The grids are removable for washing, and the lower grid has a drain to carry off excess grease from the cooking food.

Sandwich Grill

THIS circular sandwich grill resembles a waffle iron in appearance, but is designed to be much more versatile. For refreshments at bridge or after-theater parties, it is claimed to save time and trouble. It is adjustable to varying thicknesses of foodstuffs and by a simple turn of the hinge becomes a double griddle for cooking pancakes. A six-foot black-and-gold silk-covered cord accompanies it.

Names and addresses of manufacturers furnished upon request.

Ice Cold Water to Order

IN this electric refrigerator water and other drinks are cooled automatically. A removable two-gallon metal tank for holding the beverage is concealed behind the center partition between the doors of the cabinet. You pour in the liquid through a swivel intake at the top; it cools with the rest of your food, and you tap it through a button type faucet, as shown.

Versatile Table

THIS table has two tops—one of porcelain and the other of wood. If you lift the porcelain top, you may cut bread and roll dough in comfort. If you extend the wood top a few inches, you can attach your foor chopper to it. Extend it fully and you have a dining table. There are two sizes—closed 36 × 25 inches, opened 46 × 36, closed 40 × 25 inches, opened 46 × 40.

Baby's Bottle Warmer

HAVE you ever had to get up in the middle of the night and silence baby's cries with a bottle of milk? If you have, you know what a pleasure it is to heat her bottle to precisely the right temperature. This electrical warmer is designed to make the process easy. The makers claim that it is necessary only to place a little water in it and turn on the current. The heater automatically shuts off at the right temperature for your baby's milk.

Be Your Own Kitchen Engineer

Common Sense, System, and a Little Money Will Do Wonders

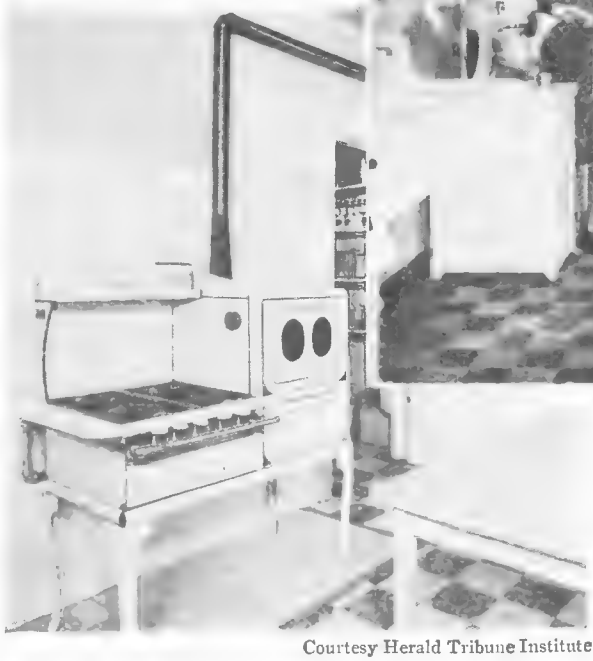
Work near a window? Why not put a porcelain top on your cabinets, and make a convenient worktable?

By Mary Jacobs

DOES every stray gust of wind blow out the flame of your kitchen gas stove? Is the door a long hike from the tradesman's entrance? Must you bend down every time you need to work at your sink? Not if a woman has had a hand in planning your kitchen. And even if it has already been planned and equipped for you, the application of ordinary common sense, plus system and a small outlay of dollars, will save you a great deal of time and effort. Each woman can be her own kitchen engineer.

Of great importance, of course, is the size and shape of the kitchen. For the family in which this room is used only for storing, preparing and serving food, and cleaning dishes, one about 9×12 feet is sufficient. If laundering and actual eating of meals be necessary in the kitchen, and if the children must have a corner to play in, then a larger kitchen is advisable. But large or small, the principles of good arrangement are the same. An oblong kitchen generally saves steps and space, for it allows better grouping of work centers. The kitchen should be near the tradesman's entrance, even when a dumbwaiter is used. It should be a short distance from the telephone and bathroom. A swinging door between it and the dining-room is best. If you have no dining-room, why not install a dinette arrangement—folding table and chairs that open from a narrow wall closet? Or try a folding table, placed under a window. Never leave a table in the middle of the room—this necessitates walking around it—always place one in a corner.

The table, stove and closet, placed close together form an ideal work center.



Courtesy Herald Tribune Institute

If you eat in the kitchen, put your table in a corner of the room, beside a window.

Courtesy Home Making Center

Note the compact and convenient arrangement of equipment in this kitchen; its oblong shape saves space and footsteps.

The storage shelves, sink and worktable form the nucleus of the food preparation center; the worktable, cabinet and stove are the basis of the cooking and serving center; and sink and dish cabinets with their appurtenances constitute the clearing-away and dishwashing center equipment, for each process should be grouped so as to save footsteps. For example, have the cabinets or shelves for storing food near each other; in washing dishes, keep the drainboard of the sink on the left for a right-handed person, and keep the dishes in a cabinet to the side of the drainboard. Concerning general equipment, each kitchen must contain a stove, sink, table, cabinet, chair and refrigerator. If space for the cabinet is far away from your worktable, get a small cabinet with shelf space and attach to the wall back of the table, or put up shelves yourself near the sink or beside the range. A small closed cabinet for knives, smaller utensils and little gadgets, can be easily erected near the sink, and will provide ready access to these frequently used articles. Enameled metal is most satisfactory for cabinets; enameled wood may be used with good results. Hooks for pots and pans over the (*Continued on page* 166)

Light—Is It Waves *or* "Bullets"?

Physicist, Relativist, and Layman Discuss the Relation Between the Rival Theories of Light and the Existence of an Ether Which Fills Space

By Donald H. Menzel, Ph.D.
Lick Observatory, Mount Hamilton, California

Layman—In one of our previous discussions you kept referring to the "ether." I looked the word up when I got home and found this: "The ether is a substance that permeates all space. It transmits the vibrations of heat and light." That doesn't come up to my idea of a definition.

Physicist—I'm afraid I can't help you very much to obtain a better one. Perhaps if I briefly trace some of the ideas that led to the invention of the ether you will see why. Among the many problems that early attracted scientific attention was that of light. Sir Isaac Newton advocated the idea that light is composed of corpuscles—little particles that produced the sensation of vision when they struck the surface of the retina. Christian Huygens, one of Newton's contemporaries, suggested that light was a wave-motion—a vibration.

It is impossible to conceive of waves without some medium to transmit them. There is no air or gas in vast regions of space between the earth and the sun, yet light and heat reach us even from the distant stars. Consequently the scientists conceived a hypothetical medium and called it the ether. You can readily see that your definition covers practically all that could be known about it. *Light reaches us—light is a wave motion—it is the ether that transmits the waves.*

Relativist—The best definition I have ever heard is that given by the Earl of Salisbury, "*Ether* is the *nominative* of the verb *to undulate*." That "covers" it.

L.—I suppose that Newton's corpuscular theory didn't require the ether?

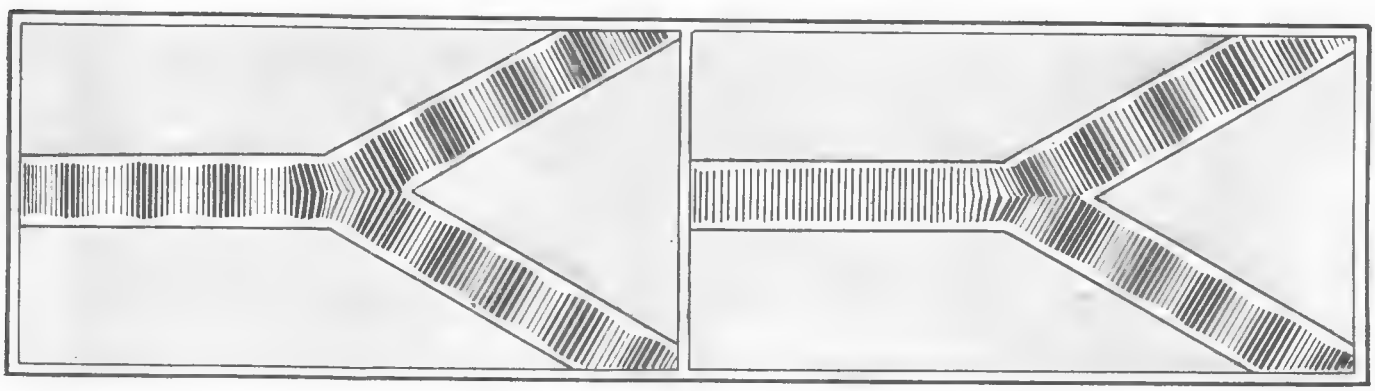
P.—No. He pictured the stars as shooting these tiny "light bullets" at us.

R.—Pardon me. As far as the transmission of light through space is concerned, you are right. It is not so well known, though, that Newton finally had to fall back on the ether to explain another phenomenon in connection with his theory. He had observed the fact familiar to everyone that light, falling on a pane of glass, is partially reflected, partially transmitted. This puzzled Newton. "Why," he asked, "are some of the particles of light affected in one way and some in another?" The suggestion he made to account for this seems strained and artificial to us today, viz., that a rapidly pulsating ether filled the entire universe, and the condition that determined whether the corpuscle was reflected or not was the state of rarefaction or condensation of the ether at the surface of the glass.

P.—That is news to me. But since a light wave is little more than successive condensations and rarefactions of the ether, I don't see why Newton objected so strenuously to the wave theory. You recall that the great prestige of his name served to retard for almost a century its acceptance.

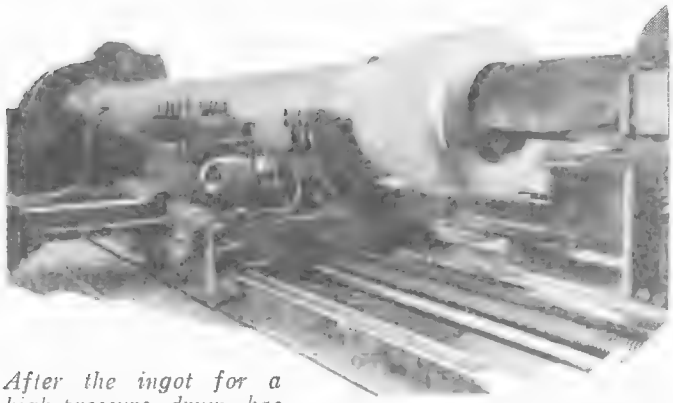
R.—Yet Newton always spoke rather conservatively regarding the wave theory. He was conscious of certain of its advantages. He rejected it on grounds that he considered very weighty at the time—and they were. When light waves pass a material object, like the edge of the wall, they do not penetrate into the shadow. On the other hand, water waves, on passing the wall, would spread out on (*Continued on page* 180)

Young's experiment is easily performed. The only equipment necessary is two cards of convenient size. The results indicate in an interesting fashion the truth of the waviform theory of light and the existence of an ether which transmits it to our own planet, the earth.



This diagram illustrates how, when the crests and troughs of waves in two converging canals coincide, they reinforce each other and carry the wave motion on into a third canal. This has an important bearing on the wave theory of light.

In this diagram the crest of each wave coincides with the trough of the one meeting it. The result is a neutralization of the wave motion, and the surface of the third canal is unruffled. An analogous effect can be produced with light



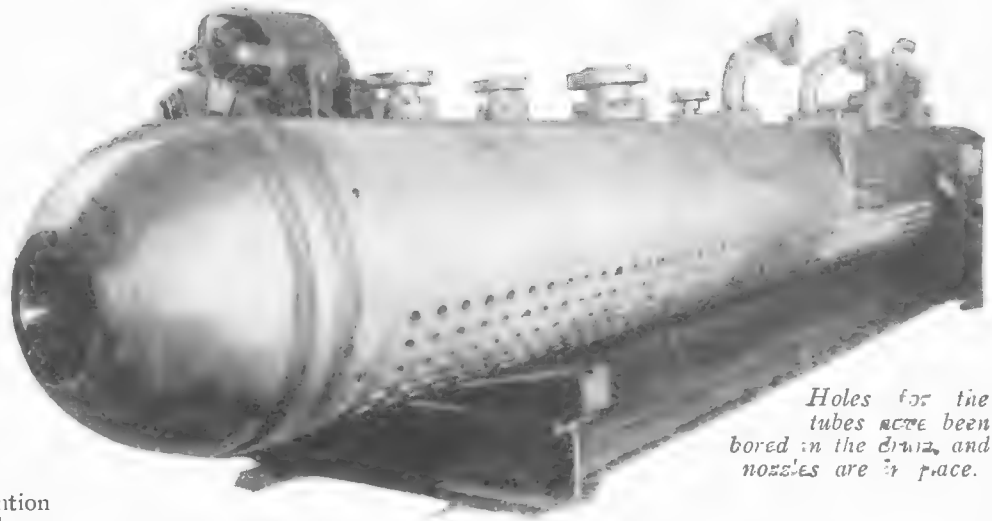
After the ingot for a high-pressure drum has been worked out to the right length, its inside diameter is bored out on a giant lathe.

A 14,000-ton forging press shapes the ends of the huge drum to the form required.

By J. B. Crane
High-Pressure Expert, Combustion Engineering Corporation

Getting Up Steam

With High-Pressure Equipment the Engineers Are Making Two Fuel Units Do the Work of Three in Generating Power for Industry



Holes for the tubes have been bored in the drum, and nozzles are in place.

WHILE the nation's attention has been centered to a large extent on hydro power, engineers have been working out methods of making steam power generation more efficient. Following the lead of European power men they are introducing high-pressure steam generating units with a satisfying measure of success. In fact such is the success that ninety percent of all boilers ordered for power purposes today are for 350 pounds pressure or more, whereas ten years ago the preponderance was just as definitely in favor of low-pressure types.

Power is obtained from water in liquid form by dropping it from a higher to a lower level. The difference between the levels is known as the "hydraulic head," and the power increases directly with the head. In the gaseous or steam state power is gotten through the difference between a higher and a lower heat content, a difference known as the "heat head."

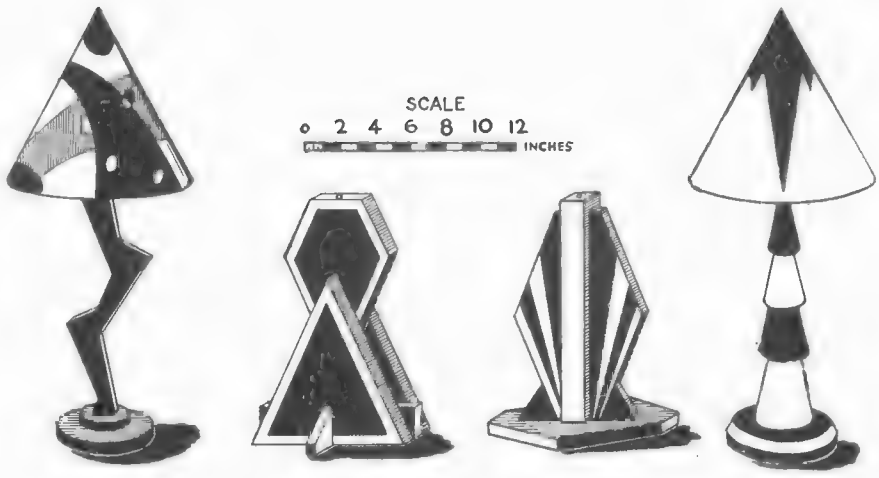
It is possible to increase the "heat head" by applying heat to steam, but to obtain full advantage of this superheating process, as it is called, it is necessary to increase the pressure under which the steam is generated. This at bottom is the reason why high-pressure equipment is being adopted so readily.

The best 200-pound plants operate for about 22,000 B.t.u. per kilowatt hour while the new high-pressure plants operate for about 12,600 B.t.u. per kilowatt hour or for less than two-thirds the coal required for the low pressure plants. This means a 2000-pound pressure plant will use only two carloads of coal against three carloads for the 200-pound pressure plant, assuming that both plants generate the same amount of power.

The use of high pressure has made necessary many interesting changes in design. The tubes are the same outside diameter but are only one-eighth of an inch thick for 200 pounds pressure and 7/16 inches thick at 2000 pounds pressure. The thicker tube has several advantages. The heat is better distributed about the tube. The thinner tube when it fails is likely to split for quite a distance either putting out the fire or necessitating an (*Continued on page* 192)

The drums shown below are for a 1,400-pound high-pressure plant for the Milwaukee Railway and Light Company.

The design is the thing in the construction of modernistic lamps. You will have no difficulty if you follow the scale at the right. It is not necessary to have any elaborate set of tools to construct these attractive lighting fixtures.



Angular lines and startling color contrasts will make these lamps a worthwhile addition to your home. Besides they will provide something unique in the way of furniture and relieve the tediousness of variety store lamps.

Make These Modernistic Lamps

Snappy Color Combinations and Unusual Lines Make These Lamps Just a Bit Different.

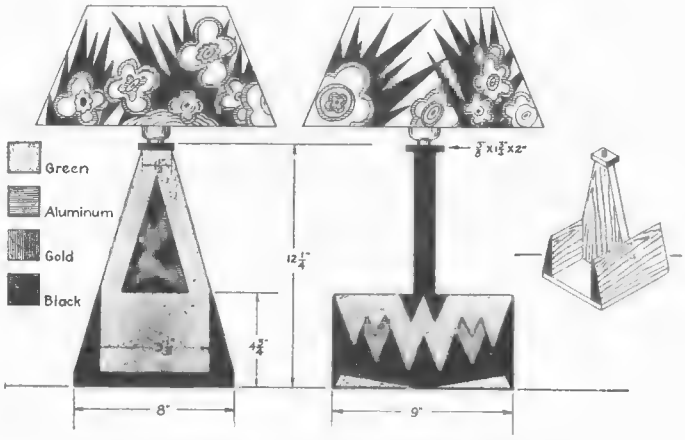
By H. L. Weatherby

Director of Manual Training, Montgomery County Schools, Montgomery, Alabama

TO the casual observer, designing and constructing of modernistic furniture looks like an easy undertaking. It may resemble so many blocks, or boxes, piled in an aimless fashion, with spots of color thrown here and there wildly in a monotonous manner, and with an absolute disregard for all that we formerly called art and beauty. The thing grows on you though, until finally you fall in love with this new form of expression. If you think it is easy to design one of these curious jumbled-up-looking pieces you will probably have formed a different opinion before you secure a pleasing proportion of masses and a harmonious blending of bright colors.

It is true that the construction is usually simple—lines straight and difficult joints few; but poor workmanship will be quite as evident in a piece of modernistic furniture as in a copy of an old masterpiece.

A room in the home furnished in Modernistic furniture is in tune with the time and not too difficult an accomplishment for the average home woodworker. Woodworking machinery is not necessary but is always a help. A fitting project to start with is a lamp for the reading table. Shades in varying degrees of Modernistic and Futuristic patterns can be had from art stores, and even from the "Five-and-Ten." For the construction one needs only a few scraps of wood of a variety that will not split readily. Nails, and screws largely take the place of joints and glue is used sparingly.



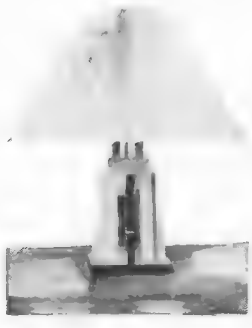
Here is the complete layout for the bases of two attractive lamps.

The writer has furnished with this article drawings for a lamp that he calls the "Novelty Lamp." It is an extremely useful as well as novel piece of furniture. Placed on the study or library table with its group of small volumes at hand, it fills a double rôle—that of reading lamp and book rack. Its construction is quite simple to anyone familiar with wood-working tools.

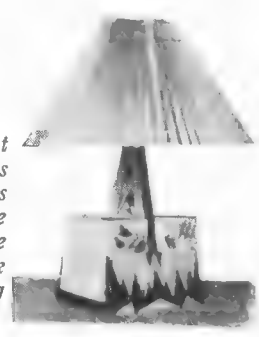
In decorating or finishing the novelty lamp, three or four colors should be used. With the lamp as illustrated, the whole stand was given several coats of lettuce-green enamel. Following this, the design was laid out on the lamp with a soft pencil and the other colors were painted over the green. To get good sharp outlines, without which the job will not look well, an ordinary draftsman's ruling pen was used with the black enamel; all areas were outlined with this. The color used was then painted up to these outlines with a small brush. The black lines may be placed following that of the colors if so desired, and will probably result in sharper edges.

In case the book-rack lamp is not what is desired, a few general suggestions, which will apply to all of them, are offered.

The height for a table lamp including shade will probably be 20 to 25 inches. The base must be large enough, and weighted if necessary to prevent the lamp from becoming and appearing top-heavy. A short length of eight-inch pipe should be threaded and screwed into a ⅜-inch hole in the top of the stand, to which a socket or other fixture is attached. A hole should extend vertically through the lamp for the cord. Quick-drying enamels will be found much more satisfactory than lacquers, since they will not "pull up" with successive coats.



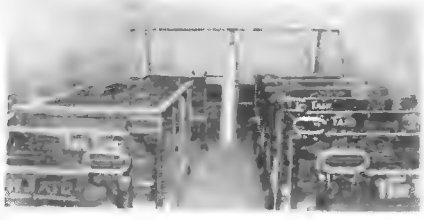
The "setback" principle applied to modern lamps gives a strong impression of the trend toward geometrical lines in the design of modern furniture.

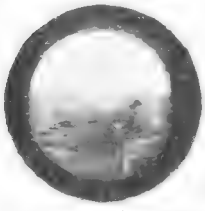


A parchment shade completes the picture. This lamp serves the twofold purpose of book-rack and lighting fixture

Inventors "Cut Loose" *in* Motordom

U-Boat Vision for Bus





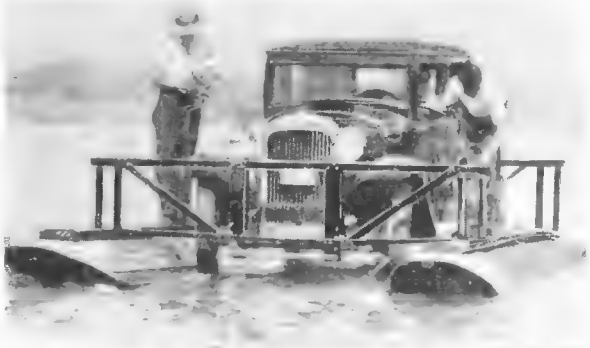
OPERATING one-man buses on the streets of Chicago has certain difficulties, chief among which are low bridges and trolley wires. These constitute a serious menace. In order to enable one man to handle the situation and to tell him exactly when a passenger has left his seat, buses are now being equipped with a special periscope. This gives the driver a clear view of the upper deck.

This Car Is a Wood Burner

A U. S. Army truck was fitted with a gas generator. Chips of wood were converted into gas on the truck itself. This gas was then passed through four cylinders before being used for driving the engine of the truck. The wood thus served as a substitute for gasoline.

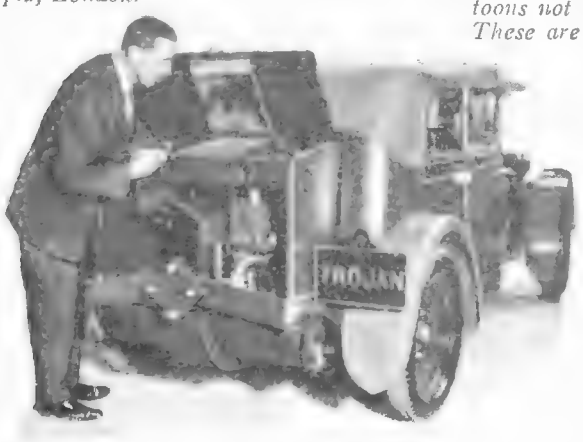
Travels Road and Wave

A combination automobile and boat has been built for use in lifesaving or for pleasure. This trim craft can be readily launched from the beach and then becomes a speedy boat. The rear wheels are double tired so as to enable the craft to work its way out of the slipping sands and oozy mud. It might be suggested that the extra tire on the side of the boat can be used for life-saving purposes. A propeller at the rear operates the vessel in water.



Engine in Luggage Case

An engine where the luggage case should be is the feature of the new 10-horsepower Trojan, exhibited at Olympia, London.

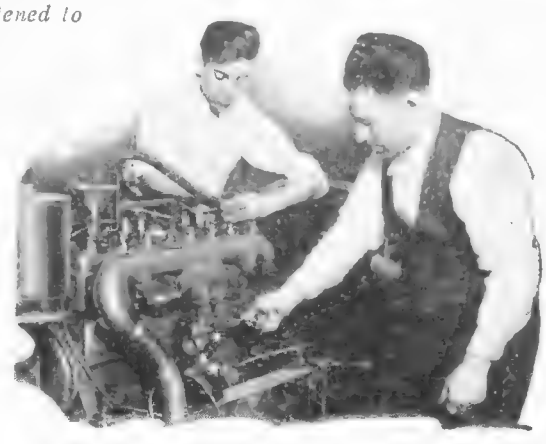


Here's a *Real* Motor-Boat

An amphibian automobile was recently driven through the streets of Winnipeg and then into the Red River. This automobile, designed primarily for fishing, is equipped with a pair of pontoons not unlike regular plane pontoons. These are attached to racks fastened to the car, and when the car is out of the water the pontoons can be removed and placed on the top. The machine has a water speed of 20 miles an hour and is very steady even in rough water. The inventor has not told us whether he fishes from a comfortable seat or stands on either pontoon.

Carburetor Vaporizes Crude Oil

A special carburetor with two small compartments containing chemicals electrically heated changes fuel oil into a vapor that can be used in the gas engine.



The way I see it—

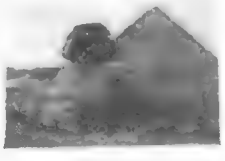
By Murray Godwin

Twice as Many Guns

Navy Recruiting Bureau, New York

MODEL SHIPS, built of an alloy originated by Franz Felder, a German inventor, have demonstrated their ability to remain afloat under loads which sent wooden models of similar dimensions to the bottom of the testing tank. According to a press correspondent who watched the demonstration, Herr Felder's discovery will prove a great boon to the navies of the world. Warships constructed of the new material will be enabled to carry twice as many guns as those of the present time and also will be practically unsinkable. . . . The future presents the possibility of fighting ships emptying twice as much explosive into each other in a given time as is now possible and remaining afloat until the last workable gun is fed with the last bit of unexploded ammunition, provided anyone is left to feed it. This prospect, however, does not appeal to us as being a scientific advance. Perhaps the inventor agrees with us to a certain extent, for he has confided his hopes that someone will give him a chance to build a motorship of his alloy, so that he may show its value in commercial service. . . . However, the gentlemen of the press (or at least one of them) saw first of all in the new alloy a means of prolonging naval engagements. Which seems to indicate that something more than limitations conferences is needed to prepare the way for a world of industry, peace, and progress.

The Temple of the Tomb



American Museum of Natural History

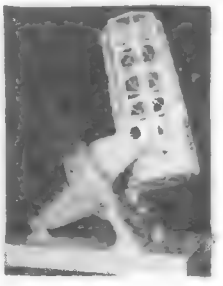
SO much time, energy, talent, and ceremony have been expended on death by the so-called human race that Bernard Shaw once built up a very fair argument to the effect that death, and not life, was the historic object of man's most intense desires. You will find this argument put into the mouth of Don Juan in "Man and Superman," and very plausibly put, too. . . . We have forgotten whether Shaw made use of the abundant support for his case offered by the tombs of the ancient Egyptians. One of the largest of these has been brought to light recently. . . . It is 160 feet by 320 feet in size and contains forty burial places. In many of these were "carefully wrapped mummies in anthropoidal or rectangular coffins. A number of these coffins are brightly painted with elaborate religious symbols and in hieroglyphs." It is evident that many a craftsman and artist of old Egypt spent his fondest efforts in devising decorative motifs for mummy cases, and many an engineer exerted himself to perfect the technique of building tombs. As for the morticians, their art reached a height of elaboration and they themselves a dignity which, despite advertising appropriations, they have not achieved since. All this seems to indicate that, with the wealth of Egypt at their command, the Pharaohs found the most satisfactory goal for their hopes and yearnings in the grave.

Cold Tracks

American Museum of Natural History

ABOUT 85,000,000 years ago a lone dinosaur, galloping across New Jersey, slipped and fell on a little hill near Woodbridge. This mishap, which has been brought to light a trifle late to evoke much active sympathy for the old fellow, nevertheless will be commemorated. Plaster impressions of four of his tracks, including the one he made when he missed his footing, will be cast and distributed to scientific centers for permanent preservation. . . . The investigators judged that the dinosaur had been in a hurry because on the level his tracks were eleven feet apart, and the steepness of the ancient hill is evident in the fact that here his stride had been cut down to nine feet. The prints were discovered by clay miners fifteen feet below the top stratum of the Cretaceous period. As each new clay pit is dug, a watch will be kept for other tracks. Eventually it may be discovered where the dinosaur was coming from. . . . It would be interesting also to know what was chasing him.

A Lady Tells



General Electric Company

A DAY or two after the Lowell Observatory had definitely announced the existence of a new planet, Laurel Miller, who has an astrological business in New York, confessed to having been on intimate terms with the latest addition to our solar system for the past ten years. It seems that the new planet's name is not Percival Cronos at all (to avoid controversy we call it by a title covering the principal proposals to date), but Elsar. Miss Miller got to know Elsar about 1922 and wrote a book about his significance from the astrological point of view. Ever since she discovered him she has been using him for a trouble light in her investigations of the future. We say a "trouble light" because Elsar has revealed that many new diseases are on the way to the world. Elsar's specialty is the control of bodily growth, it appears, and also strength and the "passing transition" of the human form. On the other hand, Miss Miller foresees that, while the new diseases rage, human destiny will be controlled by the duplication of rays or magnetic energy of heavenly bodies, the magnetic counteraction of adverse energy, and the transmutation of the resultant vibrations to human purposes. . . . Our own astrological findings disagree slightly with Miss Miller's. As near as we can tell, the planet she calls Elsar is the same one which we ourself discovered in 1919 and named Rhum Chaud, in honor of the astral fluid that filled our telescope until we took the cork out and transferred it to ourself. Shortly after the transference we began to figure, compute, calculate, forecast, prevision, and prophesy. Among our visions we remember an endless caravan of purple camels, in which we read the approach of a long drouth. We foretold the election of 1928, the rise in skirts, the fall in stocks, the inevitability of population, the continuance of digestion, and the recurrence of weather in many parts of the world. And through it all, we prophesied, Ford cars would be sold to who could buy them, and the terrestrial emanations of nodular hypotheses would impinge on the peripheral pilanthropy of pantheistic plumes-de-cheval, which freely translated is equivalent to the American term *horsefeathers*. . . . Following which we were carried home by a cheering throng, and next morning we had forgotten all about the matter. We should never have brought it up at this time except for the reminder afforded us by Miss Miller's story.

Power of Thought

New York Edison Company

EXPERIMENTS show that 2,000,000 human beings by concentrating on the same imaginary motor impulse can generate enough electricity to light a lamp of ordinary household size. This doesn't indicate, however, that 2,000,000 people are able to light a lamp in this fashion by brain power. The actual generating force is the involuntary nervous and muscular action which accompanies the mental effort. . . . If indeed there is anything in the process describable as *mental* effort. The results do not imply that the brain 'exerts itself" in any sense other than that in which an automatic signaling system "exerts itself." A sensory impression is received and in some indefinable fashion is switched to a motor "line." From then until the command to desist is received, the effort is musoular and nervous.

The Great Leon, who perfected the Death Ray Gun illusion. The effect is shooting a girl through a solid steel plate.

When Fate Fooled
The Great Leon

By Dunninger

AN insurance policy of $25,000 would bring exclamations of delight to any live-wire insurance agent: yet Miss Petite, twenty-five, who never knew a sick day in her life, was refused a policy for that amount!

And all because, as the assistant of a magical entertainer, she is fired two and three times a day from the muzzle of a large cannon through a steel plate into a net.

Hart and Enbank, 100 William Street, New York City, were the insurance agents who had to turn down what would be considered a desirable bit of business.

The illusion, one of the most sensational on the stage today, is owned and presented by the Great Leon, a magician and illusionist of considerable renown.

The effect of the illusion follows:

A smiling young miss is placed in a loaded cannon. A large sheet of examined steel is mounted in a frame directly in front of the muzzle. The cannon is fired; the report is extremely loud. The projectile is seen to penetrate the plate and pass entirely through. The young lady is assisted from the net and the steel plate is freely shown to the spectators and found to be quite intact.

Spirit mediums have time and again claimed that it is a form of spirit disintegration and materialization — in other words, that the body is transported by supernatural means from the cannon into the net, through the steel plate! As a matter of fact, the methods used are simple.

It required many years of scientific research, planning and working of several master magical mechanicians to perfect this startling and convincing magical feature presentation.

Miss Lillian White, who is shot through a steel plate three times a day.

During the experimentation several who were tried out as assistants were injured. Advertisements were inserted in newspapers requesting the services of trustworthy assistants, with the bait of bonuses for the right parties. Quite a number applied, but when Leon or his mechanicians explained what the duties of the assistant would be, all seemed to remember engagements elsewhere. To the brave came the thoughts of another day and its pleasures, so on their respective ways they went.

As there was no one forthcoming, and as Leon knew whoever did act the part of the human projectile would be endangering his life, he took the duties of assistant on himself. One day things went wrong, the Goddess of Luck winked a wicked eye, and the Leon woke up in the French hospital.

Finally things were straightened out by a well-known mechanician. For some weeks the illusion was presented before large audiences in the leading big-time vaudeville theaters of the country; but bad luck was to have its fling once more.

One evening an assistant loaded the cannon with a supply of gunpowder, without apprising the man who was assigned to this task. The "official loader" charged the cannon with another round or supply of gunpowder. When the gun was touched off the lady in the steel shell escaped injury by some miraculous chance, but the scenery was shot to pieces and a fire was averted only through the quick work of several of the actors on the bill.

More experiments followed. The cannon was rebuilt. Two years passed by. Constant experimentation brought its reward. The act was perfected and made harmless to the assistant who acted the rôle of projectile.

Another illusion the Great Leon has been associated with is the Fire and Water sensation. In this illusion a lady is presumably burned at the stake, a shot is fired and she makes her appearance in a glass case filled with water. She steps out of this case dripping wet. Several mishaps, when fate proved all unkind took place in various (*Continued on page* 181)

Do These Seven Simple Experiments

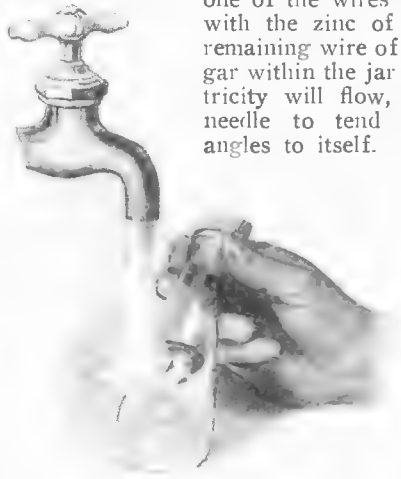
There's No Place Like the Home Laboratory for These Fascinating Physical Tests

By Raymond B. Wailes

A LAW of physics states ". . . for every action, there is an equal and opposite reaction." Pass two medicine droppers through a cork, as shown in the illustration. Make holes in the cork so that when the cork is placed in the neck of a toy rubber balloon filled with water, water will issue from the medicine droppers. If the whole device is raised by a string, water will issue from the droppers and cause the balloon to revolve.

A rubber balloon filled with water will make an ideal reaction machine.

WATER boils at 212 degrees Fahrenheit at atmospheric pressure, but it is not necessary for one to boil water on top of a mountain to prove that it boils at a low temperature, for if some water is boiled in a flask and the flask then quickly and tightly stoppered and immersed in cold water, the water within will boil violently for some time. It can be held in the hand without injury while still boiling. The cold water condenses the steam in the flask, lowering the pressure and causing the water to boil.



Warm water can be made to boil without heat if the pressure upon it is reduced.

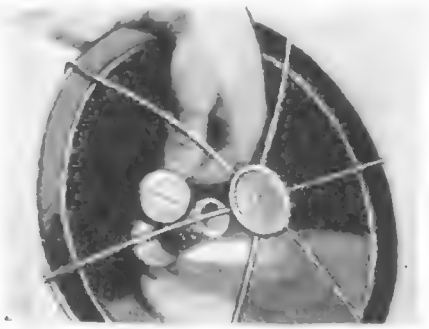
PAPER soaked in a solution of potassium bichromate and dried in a darkened room or closet will become sensitized or light-sensitive, and when it is exposed to some strong light such as sunlight, images of various objects placed upon it will be clearly seen after a minute or two of exposure. The bichromate solution can be made of almost any strength, although a pinch or two of the crystals to a cup of water is ample.

Using a paper soaked in potassium bichromate, you can secure contact photographs.

A zinc preserve jar lid containing vinegar, a honey-comb coil and a compass will make this miniature electric battery and galvanometer.

PERHAPS the simplest wet battery which can be made is a zinc preserve jar top filled with vinegar and containing a copper wire. Perhaps the simplest detector of electricity is a magnetic compass placed inside a coil of wire. By combining the two together, placing one of the wires of the coil in contact with the zinc of the jar top and the remaining wire of the coil into the vinegar within the jar top, a current of electricity will flow, causing the compass needle to tend to swerve at right angles to itself.

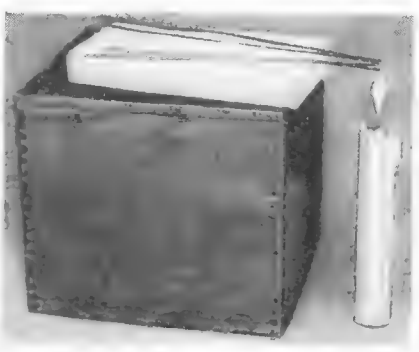
SOUND can be reflected much the same as light and to prove this it is only necessary to hold a watch in the bowl of a copper electric heater of the reflecting type. The tick of a watch can be transmitted across a room in this manner. If possible, remove the heating coil when trying this experiment.



Sound can be reflected like light

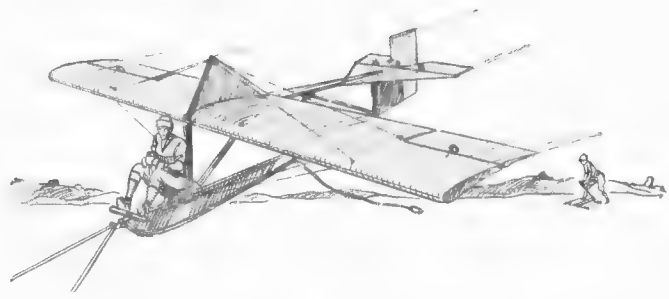
WATER-GLASS solution (sodium silicate) is used to preserve eggs. If this solution, or syrup, is diluted with its own volume of water and crystals of copper sulphate, iron sulphate, cobalt chloride, or manganese sulphate are dropped into it, dense crystal growths appear which resemble sub-sea growths. They form very rapidly.

DIFFERENT metals conduct heat with varying different degrees of temperature. Place wires of several different metals upon a block of paraffin wax so that they are spread fanwise with their ends converging and heat the ends. The wires will become hot, conduct the heat along them and melt the wax in varying degrees.



Different metals do not conduct heat the same as shown by the different wires melting into the cake of paraffin.

A Release Trap *for* Gliders



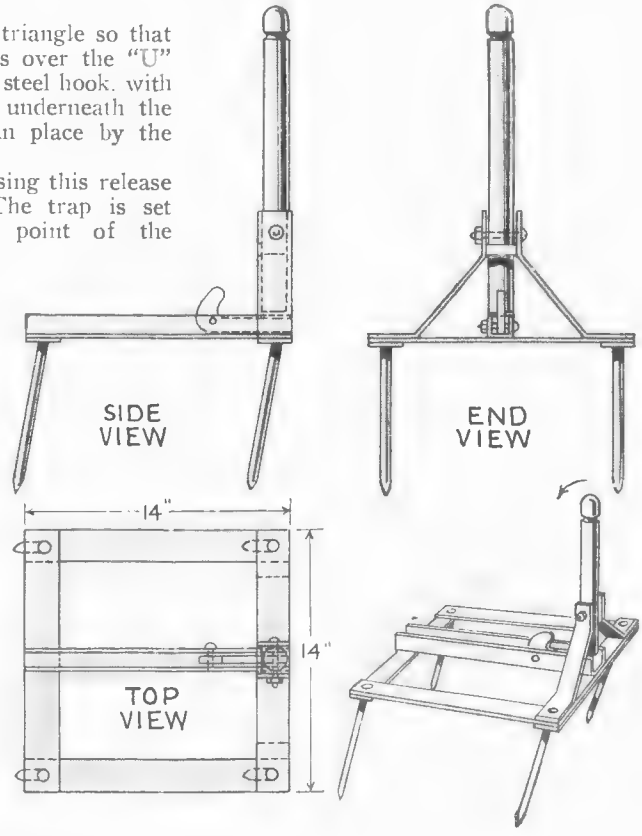
By Martin H. Schempp

German Soaring Pilot and Glider Instructor, Syracuse Gliding Club, Syracuse, N. Y.

MUCH difficulty had been encountered in our glider flights at Syracuse with the available shock cord method of starting a glider. Although it takes only one person to fly a glider, we found it necessary to have as many as twelve men (eight to pull the rope, one to hold the wing-end, and at least three to hold the tail) to start the pilot on his flight. To obviate this waste of man-power (many times it was not available, and frequently starts were unsuccessful) we constructed the release trap illustrated on this page.

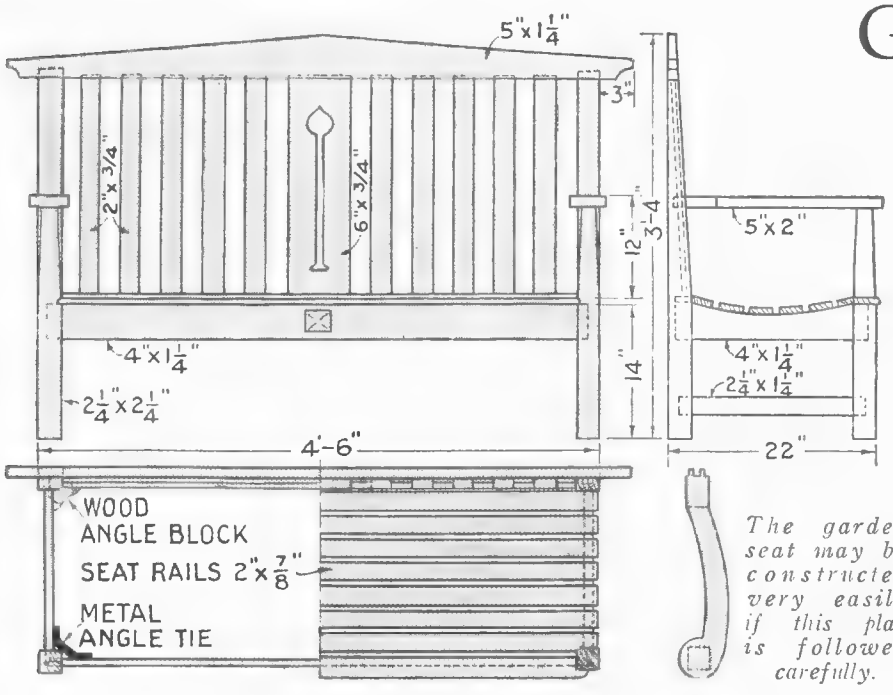
Here are the complete but simple constructional details of this extremely necessary and practical device: Make a frame 14 inches square of 2 inch straps iron. These may be welded (if you are good at welding) rivetted or fastened together with bolts and nuts. An iron strap about 14 by 4 inches is bent in "U" shape and mounted across the frame. Enough space must be left for a steel hook, which is secured by using a strong bolt, as shown in the accompanying sketch. Now fasten four strong carpenter spikes (12 inches long) at each corner of the frame. These should be inclined at a slight angle. Next take two straps (12 by 2 inches), bend them twice and fasten to the frame, forming an upright triangle. A strong wooden bar about three feet long is inserted in this triangle so that its lower end just slides over the "U" shape center strap. The steel hook, with its longer arm coming underneath the wooden stick, is held in place by the center strap.

The best method of using this release trap is as follows: The trap is set down at the starting point of the glider. The spikes are pushed well into the ground. About ten feet of steel cable or strong rope is fastened to the glider. This should not be fastened to the weak tail but to the rear end of the skid. An iron ring at the opposite end of the cable is slipped into the hook of the trap. One man stands on top of the frame, so that it will not lift out of the soft ground. He takes the bar in his hand, and when the shock cord is pulled, he lets go at the command of the pilot. The hook turns, the ring slips off, and the glider gets off to a good start.



Make a Garden Seat

By J. E. Lovett



The garden seat may be constructed very easily if this plan is followed carefully.

WHITE enameled outdoor woodwork adds considerably to the appearance of any artistic garden, as well as being an addition to garden comfort.

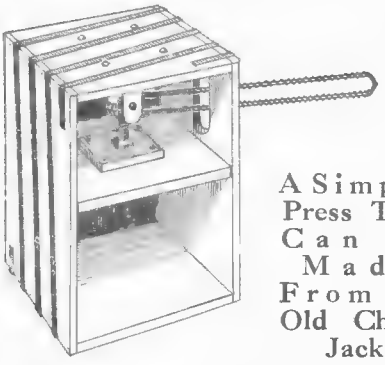
Our design shows a garden seat made low and wide for the use of cushions. The length, however, 4 feet 6 inches, may be varied to requirements, other dimensions being clearly indicated on the plan and elevations.

The back legs of 2¼ inches by 2¼ inches material, these being tapered towards the top to receive the top rail, which is about 1¼ inches thick and incidentally gives a slight cant to the back of the seat. The two front legs are of the same dimensions and are tapered to 1½ inches square at the top, where a 1 inch square stub tenon is prepared to fit into the arm.

The four (*Continued on page* 183)

WRINKLES

First Prize, $5.00.

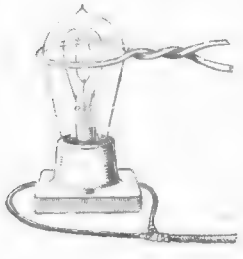


A Simple Press That Can Be Made From an Old Chain Jack

THE handy man often needs a press, and its cost may be high in comparison with the simple work to be done. An old automobile jack and some scrap lumber are all that is required to make a satisfactory press. The jack should preferably be of the chain type as the handle may prove awkward to work. The shape and size of the press may vary to suit the work for which it is to be used. In general the jack should be bolted to the top of the press as shown in the illustration. By covering the sides and boring small holes in the bottom this may easily be converted into a fruit press.—*Wendell O. Rich.*

Round Bend for Model Plane

WHEN making model airplanes it is sometimes necessary to make a round bend in the bamboo or balsa. These bends are hard to get true and even, but if they are bent, as shown in the sketch, around a hot incandescent lamp, a perfect round bend can be made. — *Burl Knutson.*



Prevent Sticking of Beeswax

ONE sometimes desires to carry a piece of beeswax in his pocket to wax thread, fish lines or for other purposes. In order to prevent its sticking to other articles, procure a small match box as one for penny matches, melt the wax and pour it into the box tray until it is level. When it has cooled

the cover can be replaced and the cake of wax can easily and conveniently be carried. The box can be broken if you desire to remove the wax.—*Leslie F. Carpenter.*

Stains on Wood

TO remove stains on wood due to plaster and putty use two ounces of oxalic acid to a pint of water. Apply to woodwork with a paint brush. Clean with water. If stains have not disappeared, apply a second coat and wash. This cleans and bleaches the wood so that it may be stained with light stains. Oxalic acid is very poisonous. —*N. P. Hodge.*

To Keep Doors from Sticking

THE tops and bottoms of doors are often neglected. That is, they are never painted or varnished because they do not show. These hidden edges if not painted, are vulnerable points where the wood absorbs or loses moisture rapidly, especially at the ends of the outside uprights where the wood grain is exposed. Be sure and paint them.—*Alice Meehan.*

Two New Contests

No. 1—$15.00 in Prizes for Home Workshop Photographs.

No. 2—$55.00 in Prizes for Photographs and Detail Drawings of Things You Can Make.

EVERY MONTH

Rules on Page 153

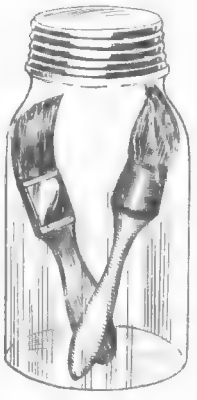
A Good Glue Cement

AN effective cement and glue can be easily made with carpenters' glue and linseed oil. Such a glue is practically water proof and has great adhesive properties. It can be prepared by soaking carpenters' glue in an equal quantity of water. When the glue has swollen, it is heated over a slow flame until it is melted and one part of linseed oil is stirred in. This makes a jelly and the glue can be used either hot or cold. When hot, it has greater penetrating power.—*John Howard.*

Furniture Polish

LEMON OIL is said to be the basic of all furniture polishes. You can buy a quart of crude lemon oil in bulk at a paint shop very reasonably, and a quart of oil lasts a long time. For using on furniture proper, dilute with one-third turpentine. Apply with a soft cloth and you will have the best polish you can buy. It is fine to use on hard wood, stained, or painted floors.—*Miss Emily Dinsmore.*

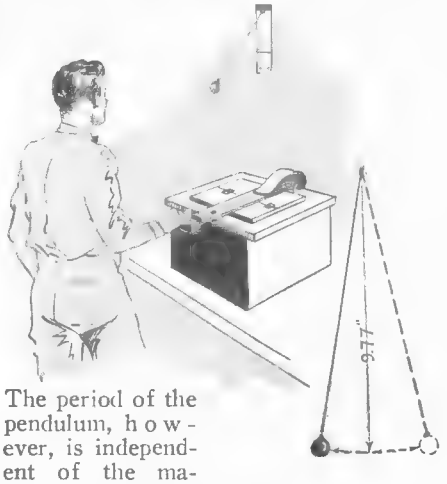
Lacquer Paint on Brushes



IT is not necessary to wash paint brushes upon which lacquer paint has been used to keep them soft. When through painting, put the brushes in a common fruit jar, screw the top on tight and they will remain in good condition. Any hermetically sealed jar will serve.—*E. Schwartz.*

Timing Exposures of Prints

A SIMPLE pendulum, as illustrated, furnishes a good way of timing the exposure of prints. Mine has a period of one second—it takes the bob one second to swing from A to B and back to A. The distance from the point of suspension, O, to the center of gravity of the bob is 9.77 inches.



The period of the pendulum, however, is independent of the material of the bob or amplitude of the arc. To make an exposure of one second, release bob from A and at same time push button controlling white printing light; when the bob has made a complete swing, release pressure.—*B. Summerville.*

Emergency Can Opener

WHEN a regular can opener is not at hand, the method shown in the sketch may be employed to open cans. Place a stick lengthwise on a penknife, near the sharp side of the blade. Punch a hole in the top of the can, and use the knife as a lever, working up and down, while the stick acts as a fulcrum, or point of leverage. — *Louis Andrews.*

and RECIPES

Cleaning Paint Brushes

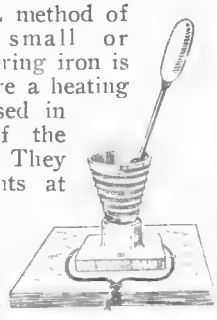
YOU can clean your paint brushes with a bar of common washing soap under a running faucet and rotate the brush to be cleaned against the soap until a good amount of suds is formed. Any paint in the brush may easily be rinsed out. Shape the bristles into a chisel point.—*John J. Kuhl.*

Home Made Gun Cleaner

AN ordinary clothespin makes a very good gun cleaner. To clean my shot gun, I pinched the prong end together and wrapped flannel around it. Then I thrust it into the gun barrel. The prongs separated and held the flannel tightly against the inside of the barrel. A curtain rod can be used to push the clothespin through.—*Wilbert Henneman.*

Heating Soldering Iron

A PRACTICAL method of heating a small or medium sized soldering iron is as follows: Procure a heating unit such as is used in electric heaters of the type illustrated. They cost about 40 cents at hardware stores. Mount an ordinary porcelain socket on a small wood base and attach to alternating current circuit. Screw the heating unit into the socket and the apparatus is complete. As the unit is hollow inside, it will accommodate quite a good sized iron.—*J. Greene Mackenzie.*



To Prevent Glue from Becoming Brittle

GLUE, carpenters' or other type, can be prevented from becoming hard and brittle by adding a small quantity of glycerine to it. For carpenters' glue the quantity of glycerine added is equal to the weight of the dry glue used. For other glues, a few drops to each one-half ounce or so will usually be sufficient. If an especially flexible glue is demanded, a larger quantity of glycerin must be added.—*H. Le Blanc.*

Match Streaks

UNSIGHTLY marks are left when matches are struck on painted surfaces. This habit can be prevented, at least to a certain degree, by preparing the surface so that it is impossible to strike the match. This is done by applying vaseline with a piece of flannel and rubbing it in vigorously. When it has been rubbed in, take a dry flannel rag and polish thoroughly. A surface prepared in this way will prevent a match from lighting when struck on it, and also tends to prevent the match marking it.—*Paul Simon.*

Cleaning Copper and Brass

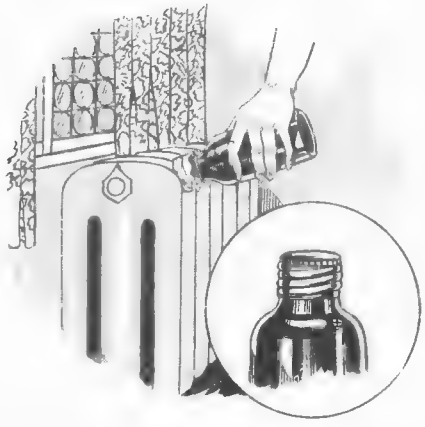
BRASS is an alloy of copper and zinc and the tarnish produced is mainly an oxide of copper or its sulphide. A quick way of cleaning it is to make a mixture, in water, of a little acetic acid or in vinegar without any water, to which a teaspoonful of salt has been added. Wipe the metal with a rag moistened with this solution, then polish with another rag. If the deposit is stubborn, repeat. This mixture will clean brass quickly. When clean, wash under running water and wipe dry.

Copper can be cleaned in the same way giving it a bright polish. Oxalic acid in water cleans more quickly but does not give so high a polish. It is poisonous.—*H. Bade.*

$5.00

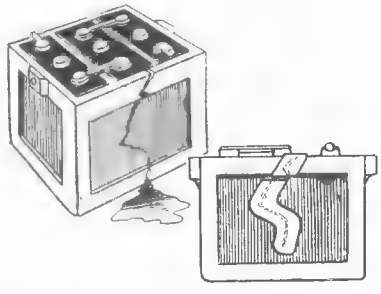
will be paid each month for the best wrinkle or recipe submitted to the editors and which they accept and publish in these columns. All other ideas accepted and published in this department will be paid for at regular rates. Address your ideas to—*Editor Wrinkles and Recipes.*

To Loosen a Bottle Cap



WHEN the screw cap on a bottle sticks, wrap a thickness of heavy cloth round it and force it in between the coils of a steam radiator. The V shaped opening between the coils furnishes a perfect vise for holding the cap while you loosen it by turning the bottle. The cloth is usually necessary only as a protection to the enamel of the radiator.—*Lawrence W. McKee.*

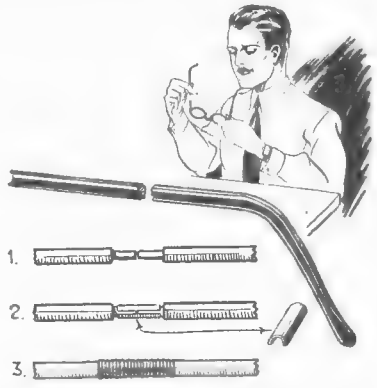
To Repair a Battery



IF your battery has cracked it casing, prop it up so that none of the liquid escapes, clean and scrape the crack and apply an ordinary tire patch to the cracked portion. The acid will not escape, and the motorist may use the battery.—*Ted Palmer.*

For Broken Eyeglass Earpiece

IF you break one of the earpieces of your eyeglasses, and must have them for use, mend the earpiece yourself. Carve the broken pieces as shown, place two pieces of metal over the



carved portion, one on each side. Then wind strong thread tightly around it, of the same color as the earpiece, and give one or two coats of shellac.—*Frank Schmulowitz.*

New Ideas for the Owner *and* Driver

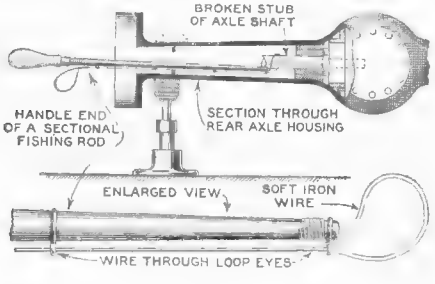
If You're Interested in Your Car, You'll Find These Articles Invaluable.

By George A. Luers

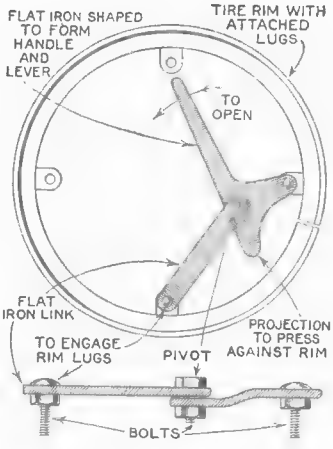
Fishing in the Rear Axle

THE inner or stub end of a semi- or full-floating axle when broken off in the housing usually requires the removal of the opposite axle shaft to push it out. If the stub can be removed without this requirement, a repair and replacement of the axle can be made quickly and with half the labor.

The handle section of a fishing rod with loops for the line is used as a guide for a piece of soft iron wire. This soft wire is tied at the end of the rod and a single loop is made, the free end extending toward the handle. This tool is carefully slid over the stub end of the axle, the slack is taken up and the grip of the wire permits extracting the stub, making this a quick and easy means to use, especially if the car is out on the road and disabled.


BROKEN STUB OF AXLE SHAFT
HANDLE END OF A SECTIONAL FISHING ROD
SECTION THROUGH REAR AXLE HOUSING
ENLARGED VIEW
SOFT IRON WIRE
WIRE THROUGH LOOP EYES

This has recently provided a means for avoiding expensive repair and towing bills in the case of one motorist.



Making Tire Rims Behave

A LABOR-SAVING method of handling demountable rims of the type having four rim lugs attached, was devised and made by one mechanic in a small shop.

A flat piece of iron is shaped to form a handle, lug holder and one end is made to press against the rim. Another piece forms a link to connect this handle to an adjacent lug. A riveted bolt forms a pivot and two projecting bolts are used to engage the lugs.

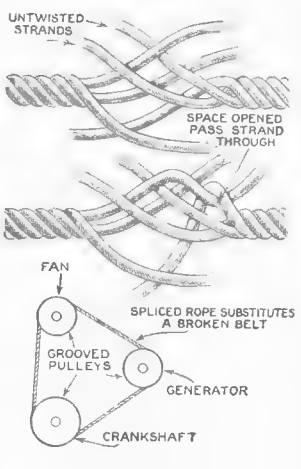
The illustration indicates the application of the tool to the rim. The method of operation will be understood by a study of the sketch.

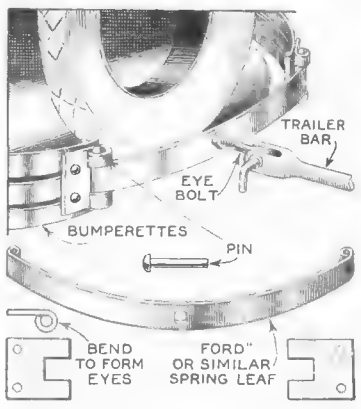
Fooling the Fan Belt

CARS on which the generator and fan are driven from the same belt, are without battery charging means when the belt is broken.

An ingenious idea of an owner in the country was to convert a rope to drive the fan and generator. The car to which this repair was made, was fitted with grooved pulleys and a hemp rope a half-inch in diameter was used.

The splice is started by untwisting the strands. These untwisted ends are brought together, and one strand at a time is woven into the opposite end by opening a space through the coils. When all ends are knitted in place, the splice can be pounded down slightly to reduce the bulk.





Tourists Attention!

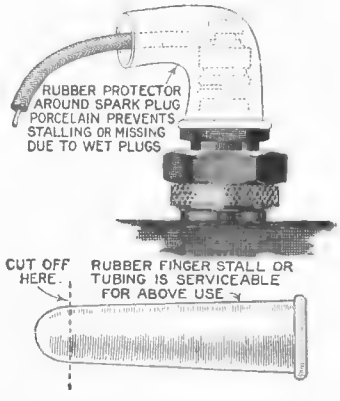
THE trailer, which has so many advantages in providing comforts for extended tours, is usually rigidly hitched to the rear of the car.

One motorist has arranged a connection which has advantage of preventing of shocks and jars when starting or stopping.

A main leaf of a spring, such as a Ford front spring, is used. Two fasteners are made of iron plate, with pins to secure these to the ends of the spring leaf and to bolt to the bumperettes on the car. The trailer is hitched to an eye bolt through the center hole of the leaf.

The construction is simple, yet has the advantages of desirable flexibility.

Raincoats for Spark Plugs


RUBBER PROTECTOR AROUND SPARK PLUG PORCELAIN PREVENTS STALLING OR MISSING DUE TO WET PLUGS
CUT OFF HERE.
RUBBER FINGER STALL OR TUBING IS SERVICEABLE FOR ABOVE USE

WATER on spark plug porcelains, due either to washing the car, rain or damp foggy weather, shunts the high tension current along the outside of the plug and causes difficult starting or stalling of the engine.

Four or six pieces of rubber tubing, about three inches in length, slipped over the terminal and porcelain prevents engine trouble from this source.

One owner adopted rubber finger stalls for this use, cutting out the ends and slipping these down on the plugs, securing the terminals and then pushing back over the secured terminal.

Solve *these* Brain Teasers *and* Win *a* Prize

By Sam Loyd

THE Puzzle King presents the sixth of a series of problems, the solving of which will show if your mathematical ability is bolstered up by logical reasoning. Prize winners of the March puzzles and contest conditions will be found on page 174.

Piles of Money

COINED money, rather than paper, is the popular medium of exchange throughout our Western States. In the same manner that Eastern bank clerks become expert in riffling paper currency, the Western tellers acquire similar proficiency in their juggling of the precious metals.

The Westerners learn to not only count and stack coins with dazzling speed, but at the same time to test the pieces for correctness of weight and metal.

Every paying teller has his own pet method of stacking the specie in readiness for paying out, and it was while one of these ingenious systems was being shown to me by a Frisco teller that a puzzle idea came forth. This is the proposition I put to him:

"How would you arrange 500 silver dollars into nine piles from which can be met any demand from a single dollar to 500 dollars, by taking up a single pile, or combination of piles—and, what is the greatest number of dollars that you could have in any one of the nine piles?"

Now, who can answer that question for him?

A Puzzle Within a Puzzle

Here is a puzzle within a puzzle. There is a message concealed in this cryptogram and after you have decoded it, you will find that it presents another puzzle. Both of these must be worked out if you would win a prize in this month's contest.

I KNOW two puzzle enthusiasts who ride their hobby together, although they have never met in person! You see, they are shut-ins, and have become cronies as a result of numerous letters exchanged in discussions of their favorite pastime.

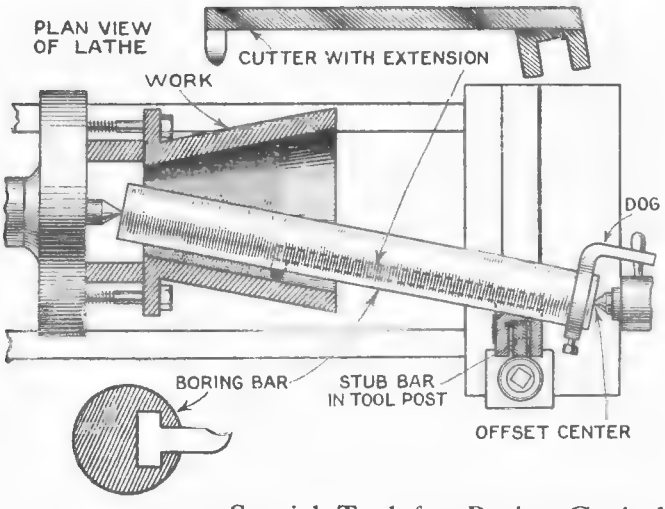
Recently one sent the other a birthday box of cigars, and the recipient liked his smokes so well that he inquired their cost, with a view to adopting the brand.

The donor's reply, as shown in our sketch, is written in code, a simple transposition of letters. This familiar form of cryptogram may be described as a message concealed by replacing each letter with another letter of the alphabet. For example, the word PUZZLE might appear in a cryptogram as AIBBER. Each letter's substitute is used consistently throughout the message, just as both Z's in PUZZLE are replaced by the letter B. Spacing and punctuation remain unchanged.

When you have succeeded in decoding that note, you will find it contains an arithmetical proposition. So, we have a puzzle within a puzzle—two puzzles to work out.

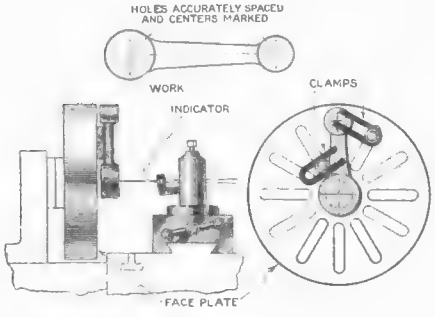
Tips for the Home Machinist

By George A. Luers



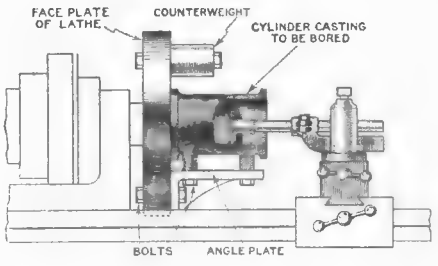
Boring Holes to Correct Center Distance

AN accurate means of boring is shown below. The job, for example, may be a connecting rod. The holes are center marked as accurately as possible. The part is secured to the face plate and an indicator is mounted in the tool post. With the indicator on the center mark of the job, the lathe is started rotating. The work is shifted until the indicator test shows centered. After boring the hole, the work is turned, so the other hole is lined up and this is tested with the indicator.



Any number of holes can be bored in the same piece of work and be held in accurate position.

Mounting Work on Face Plate to Bore

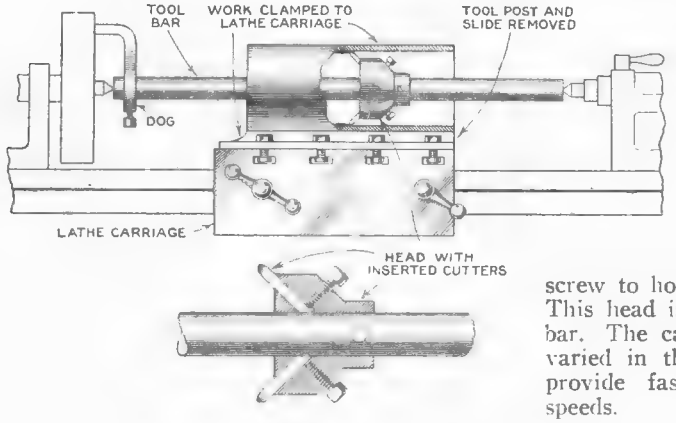


MANY jobs of boring can be chucked; however irregular work does not allow for this method of holding. Work that can be swung in the lathe can usually be clamped to the lathe face plate. In finishing a casting, the face of the angle plate is machined first, leaving the cylinder bore and flanges to be turned. As the angle plate and cylinder are to one side of the face plate, a weight is necessary on the opposite side to counter-balance, especially if the work is to be revolved at high speed.

Many times only bolts and "U" bolts are needed to support the job, but in any means used, the support should be rigid to prevent any movement.

Mounting Work on Lathe Ways

WHERE it is not possible to bore a large casting with the usual set up, a good method is to mount the job as shown below. In this the lathe carriage is cleared of tool post and slide and the casting is clamped on the carriage.



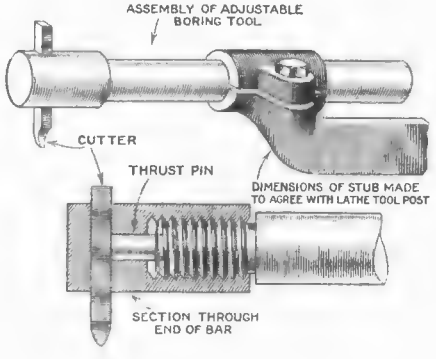
A long piece of cold rolled steel is used as a tool bar, mounted between lathe center and rotated by a dog attaching to the face plate end. A head is made with inserted cutters and small set screw to hold the cutting tools. This head is pinned to the tool bar. The carriage feed can be varied in the usual manner to provide fast or slow cutting speeds.

Special Tool for Boring Conical Hole

A JOB, which is infrequent, but nevertheless must be solved by the mechanic, is that of boring conical or tapered holes in castings. The set up for this work consists in clamping the work to the face plate and using a stationary boring bar with a sliding cutter. The boring bar is offset through use of the lathe tail stock. The sliding cutter is fed by means of a stub bar placed in the tool post.

The main solution to this work of taper boring is the tool. A long tool cutter is made having a cutter one end and two lugs at the other. The bar is made with either a dovetail or a "T" slot to hold the bar, permitting end movement only. The bar is prevented from rotating with the work by a lathe dog, at the end next to the tail stock. This dog is clamped or held by a support from the tail stock.

The same type of boring bar can be used also for boring cylindrical holes.


ASSEMBLY OF ADJUSTABLE BORING TOOL
CUTTER
THRUST PIN
DIMENSIONS OF STUB MADE TO AGREE WITH LATHE TOOL POST
SECTION THROUGH END OF BAR

An Adjustable Boring Tool

THE young machinist often finds it very necessary to have some means of adjusting a boring tool. One of the easiest methods, and one which has been used to good advantage, is shown in the sketch above. This consists of two pieces of metal threaded so that one will turn inside of the other. The headpiece is milled so as to permit of the insertion of the cutter. On tightening the boring tool the cutter is held in place so as to permit boring of cylinders or other work.

MAGIC

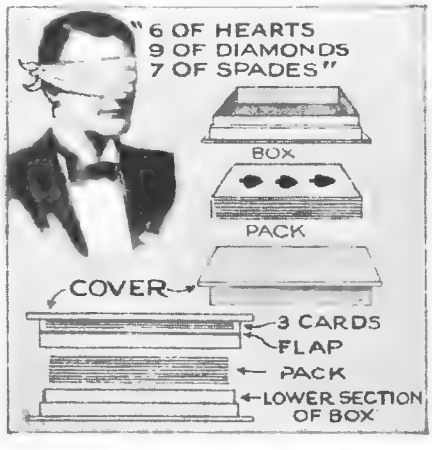
By Hunninger

The Spirit Voice

THE would-be medium tells her spectators that she is about to demonstrate spirit messages and independent voices even after having her mouth stuffed with cotton, and covered with a tightly drawn handkerchief. The lights are turned out and voices are heard. A phonograph is built into the top of the table and the starting mechanism is cleverly concealed. The record is especially made and has different voices recorded thereon.

Solid Through Solid

THE magician exhibits a glass tumbler and to prove that it is unprepared he fills it with water. He then pours the water back into the pitcher and borrowing a lady's handkerchief, he tucks it into the glass. Making a paper cylinder, he covers the glass therewith, and then picks up both glass and paper cover. He now proceeds to demonstrate that the tumbler does not interfere in the least with the handkerchief which is pulled right through the bottom. The secret lies in the fact that an oval hole has been cut in the side of the glass through which the handkerchief can be pulled. This hole is covered with the thumb when the glass contains water.

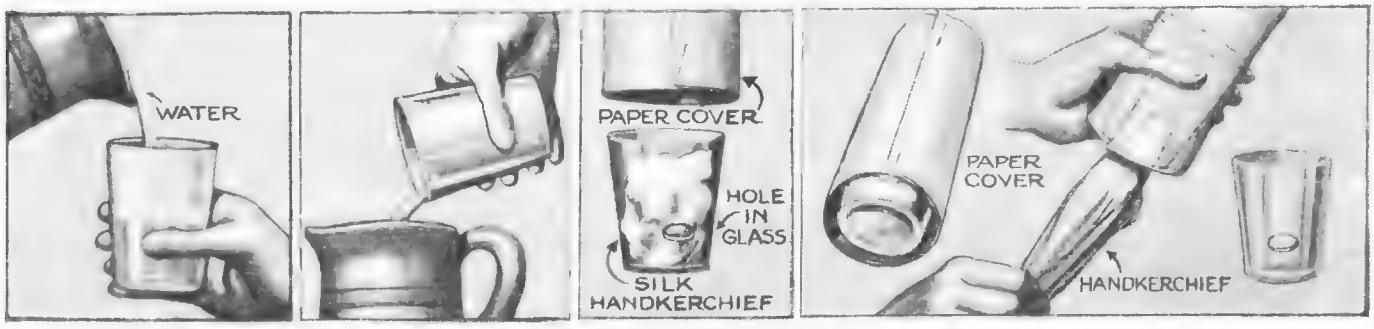


Come and Go Billiard Ball

EVERY amateur delights in demonstrating tricks which would impress the audience as being the result of years of practice. This billiard ball trick gives the desired impression. The ball is really a half ball and has a disk slightly larger than the diameter of the ball, glued to its back surface. The disk is covered with velvet. If this ball is held between the fingers, and then turned so that the velvet side faces the audience, and the hand is held in front of some dark clothing, the ball will seem to have disappeared.

X-Ray Card Trick

AN ordinary pack of playing cards is passed for examination, shuffled thoroughly, and the spectator then places the deck in a card case. The card case is covered, the magician blindfolded, and then upon command, the box is opened. The spectator then removes the cards one by one as the magician correctly names them. The secret lies in the fact that three or more cards, previously memorized, are secreted in the cover of the box and hidden from view by a small flap. When closing the box, the flap drops and the prearranged cards fall in place on top of the deck.

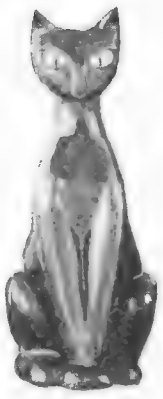


*No. 81 of a Series of Magical Articles Appearing Monthly.

This DECORATIVE CAT Is Easily Carved

For Entrance, Door Stop or Ornament

By Edwin M. Love



THE serious-faced, modernistic cat illustrated here is an interesting door stop or floor ornament that is easy to make. It is 16 in. high, but the dimensions are readily changed by altering the sizes of the squares used in copying the patterns. Almost any color is suitable for its coat, but black is recommended, with the eyes painted green.

The roughing-out of the form is accomplished by cutting eighteen thicknesses of pine to the profiles shown. These, when nailed together, give true guides for the shaping of all parts of the cat. The two center pieces are of ½-in. stock; all the rest are ⅜ in. thick. If the reader is sure of his skill, ¾-in. material, instead of the ⅜-in., may be used, reducing the needed number of patterns; but the thin wood reduces chances of errors.

This illustration shows the start of the carving.

Carving around the shoulder should be deftly done.

First of all, make patterns. Nine are all that are needed, since the cat is bisymmetrical. Divide a 10 by 16-in. paper rectangle into 1-in. squares and sketch the outline of the center piece as in Fig. 1. Make the other patterns in the same way. Then, with carbon paper, trace the first pattern on the ½-in. stock and the others on the ⅜ in. Cut the profiles with a band or jig saw, or, lacking these, use a coping saw. Be sure that the blade runs in the waste wood, just splitting the line. Strive to cut the curves as smoothly as possible. When all are cut, trace the outlines on each of the next outside layers, so that all can be easily and accurately assembled for carving. The squares on the paper patterns locate the outlines for tracing.

The wood is cut out and the individual sections are nailed together.

Assemble each half-cat temporarily by driving two or three three-penny finish nails through each thickness into the one below. Built up in this manner, they are easily carved; and if, by accident, a layer is spoiled, another can be substituted with little trouble.

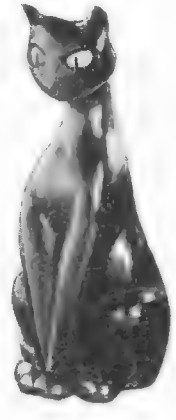
Start carving with a wide chisel. Following the outlines of the pieces, bevel side up, trim two corners at a time, so that there will be no danger of gouging too deeply in any one piece. In some places it is advisable to cut directly from one step to another, and here a ½-in. chisel is useful.

Roughly shape the back, head, and sides, cutting nearly to the bottoms of the steps. By this time the cat will begin to look quite well rounded, and some details can be put in. Cut squarely in around the tops of the thighs, reducing the depth of the cut to nothing where the line becomes vertical. See Fig. 4. Carve the sides and round the belly, carrying it smoothly to the center layers, but without forming a distinct line in the middle, rather making a shallow curve. Now round the tops of the thighs, dipping them downward toward the body, so that they flow in a smooth, unbroken curve to the bottom of the piece.

The shoulders are cut along the back in the same way as were the tops of the thighs. A veining tool is handy here, but a narrow flat chisel will do. This line also dies away toward the back, so that the free, clean sweep of the curve there is unmarred.

The breast forms an S-curve with the

(*Continued on page* 169)



Would You Believe It?

Makes Your Hair Stand Up

UNLESS you saw hair standing on end, you would scarcely believe that such a thing were possible, but here is an actual photograph of a demonstration. A grounded plate is held over the head of the victim while his hand touches the ball electrode of an Oudin resonator.

Heatless Furnace Gets Hot

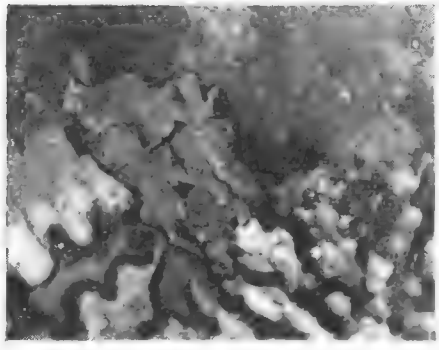
IN a high-frequency crucible furnace one can insert his or her finger in the interior without in the least feeling any discomfort. The furnace itself is absolutely cold. Let the individual put a ring on his finger, and in a short time the ring becomes unbearably hot, and the finger must be quickly withdrawn, otherwise a severe burn would be produced. A high-frequency furnace is operated by a source of alternating current supply. Its oddness is being demonstrated by Miss Margery Lytell at the Museum of Peaceful Arts in New York.

Photo by Ewing Galloway

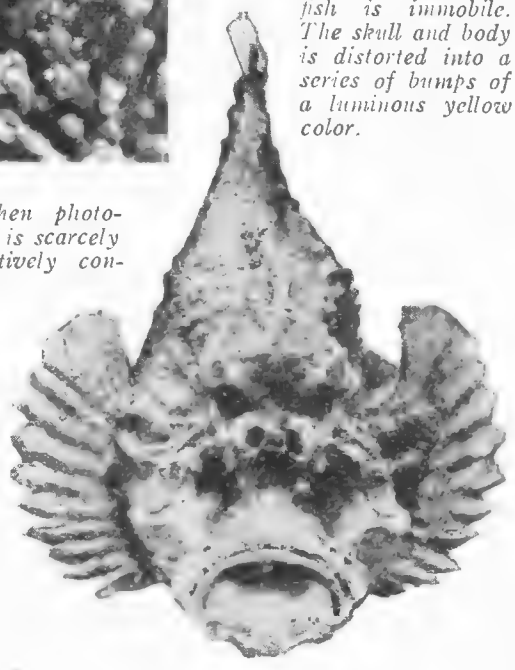
Let the Birds Catch Fish for You

CHINESE fishermen let cormorants do most of the work. They tie strings around the necks of these birds to prevent their swallowing the fish. The men then rob the feathered friends. The birds never become discouraged by the trick played on them and go right on catching fish.

Poison Fish Imitates Stone

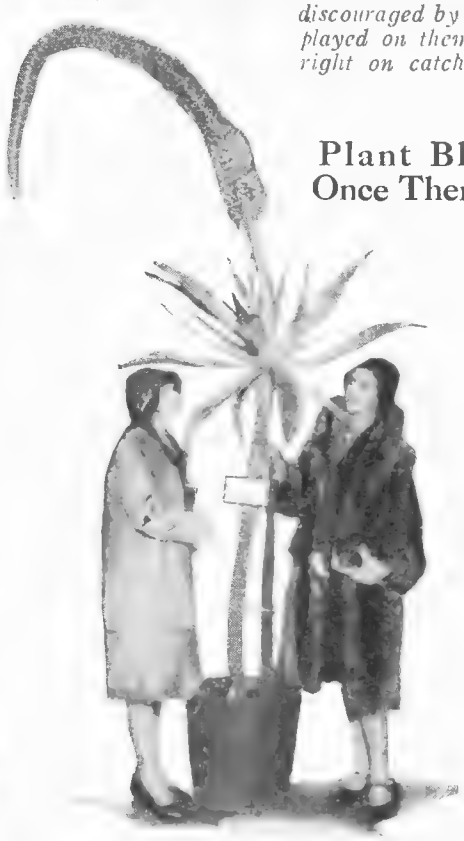


A HORROR of the sea, a poisonous stone fish, lurks in the coral beds of the Great Barrier Reef, Queensland. When touched with a stick, poisonous spines arise. This fish is immobile. The skull and body is distorted into a series of bumps of a luminous yellow color.

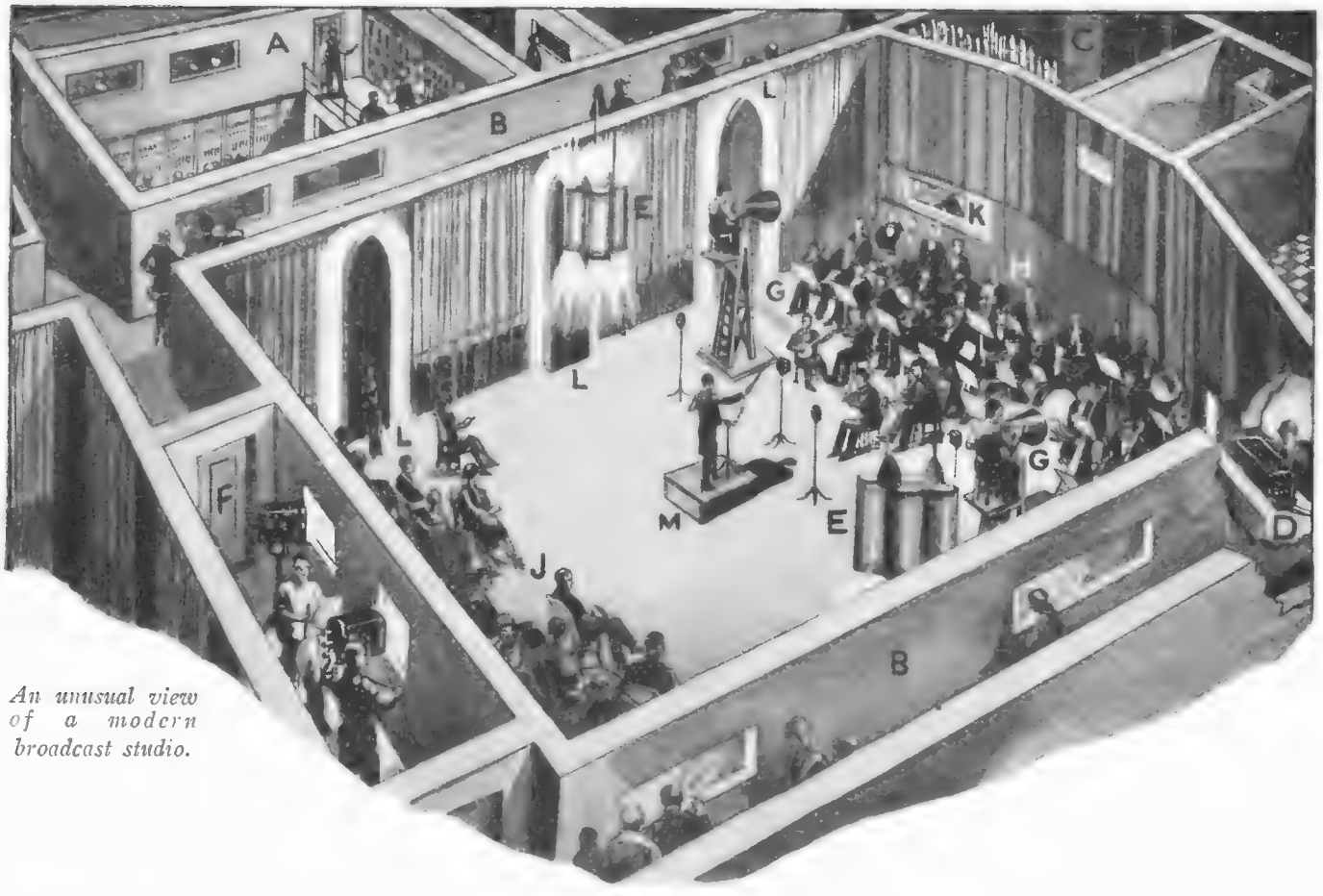


THE stone fish when photographed in the deep is scarcely visible, it being effectively concealed by ledges of coral or by the shells of clams. In the photograph above it is seen just to the right of the open clam shell. When first observed, its mouth was kept tightly shut. At intervals the fish ejects a current of water, its bony gill covers do not move. There are many cases of death from stone fish poisoning.

Plant Blooms Once Then Dies



A WONDERFUL specimen of the century plant has bloomed for the first and only time in its life at the Conservatory in Chicago. Some century plants die just as soon as the flower goes to seed. This is one of the group of Agave that blooms only once.



An unusual view of a modern broadcast studio.

Behind *the* Scenes *at a* Broadcast Studio

By M. W. Newberry

Illustration by the Author

THE days of radio programs which consisted of two or three performers and an announcer, who did almost everything but operate the transmitter, are gone forever. In the place of these somewhat scanty programs have come ornate presentations consisting of a large orchestra, a chorus, and several featured singers. To accommodate such grandiose entertainment, the whole technique of broadcasting, from continuity writing to studio construction, has necessarily been changed.

The present-day studio presents an appearance like the illustration on this page. Flood lighting plays no little part in the attempt to create an atmosphere about the players. The cast and orchestra are so arranged that the correct volume of sound is picked up without any extraneous noises. To further this end various microphones are placed at strategic points. New directional microphones—mounted on a platform and operated by a studio technician, have recently been installed in the New York studios of the National Broadcasting Company. These microphones have been used in programs such as the Westinghouse Salute, where the effect of distant voices has been desired. Presiding over the broadcast program is usually a program director, whose job it is to see that the precious moments are utilized to their fullest degree. The announcer usually stands at a switchboard to make the incidental announcements which come during and after the broadcast. He is the one largely responsible for the program's signing "on" and "off" at the right time.

In most studios acoustic effects are obtained by using velvet drapes. These curtains are adjusted so that the correct amount of sound reflection or absorption is obtained. It is the incorrect adjustment of these drapes which causes the hollow sound which sometimes comes through the ether. In the new Chicago studios of NBC there has been used a wall constructed of specially designed units, which may be adjusted to regulate the quality of the sound reflected by the walls. In the picture above, "A" is the control-room of the broadcasting studio, "B" is the observation corridor, "C" is the organ loft, "D" is the monitoring room, "E" are the floodlights, "F" is the projection room, "G" and "H" are the orchestra and chorus, "J" is the audience, "K" is the organ room, "L" are the pylons, and "M" the director of the orchestra and program. The directional microphones may be seen with the operators mounted on the platforms.

The scene in a broadcast studio is usually one of great informality. At times the musical director places himself outside of the range of the microphone and tells his individual players his opinion of their work—good or bad, as it may seem to him. The actor and singers of any radio drama do not hesitate to express their opinions of one another, but always being certain that they are far removed from the tyrannic "mike." Sometimes the program director, with script in hand, moves toward the players and urges them to speed up the scene, for he knows only too well how the time flies.

The new Chicago studios of the National Broadcasting Company, located in the huge merchandise mart of Marshall Field & Co., typify the latest design in modern broadcasting technique. This set of studios occupies the entire two top floors of this new Chicago skyscraper in the "Loop."

Two New Prize Contests

WITH this issue, SCIENCE AND INVENTION inaugurates two new prize contests that should be of interest to the man who likes to make things. Details and conditions follow:

$15.00 in Prizes for Home Workshop Photos

SCIENCE AND INVENTION will pay $15.00 monthly for the best photographs of home workshops accepted and published. There will be two awards—a first prize of $10.00 and a second of $5.00.

Conditions of the contest:

1. The workshop must belong to the contestant submitting the photograph.

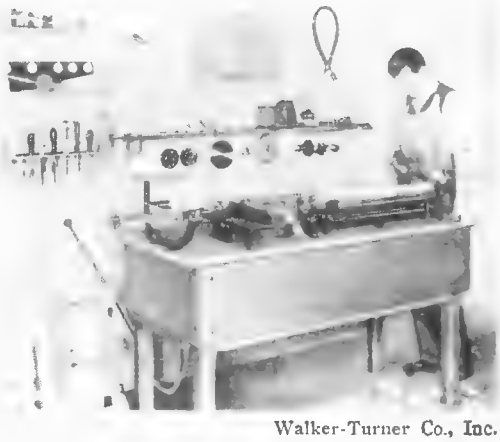
2. Photos should be sharp and clear. Not smaller than 4 in. x 5 in. (Do not send films; glossy prints are best.)

3. A rough sketch of the plan of layout should be submitted, with a list of the equipment and tools.

4. Awards will be made on the basis of completeness, practicability, arrangement of equipment, material and tools, and compactness.

5. Each monthly contest will close on the 15th of the second month preceding date of publication.

6. The opinion of the judges will be final. In event of a tie, an award identical with prize tied for will be given each tying contestant.



Walker-Turner Co., Inc.

An example of an ideal workshop.

$55.00 Monthly in Handicraft Contest

Readers of SCIENCE AND INVENTION Magazine who build things will find that this contest not only opens an avenue for the presentation of their ideas, but also offers an opportunity to gain cash awards for detailed descriptions of their handiwork. In this contest the builder can enter any article he has made. It can be built of metal, wood, cement, plaster, wall-board, or in fact any material that is suitable to construction.

The size of the object is immaterial. An article as small as a match-box stands as good a chance of winning first prize as a construction as big as a house. All items will be judged from the following standpoints, the one considered best will be given first prize, next best will receive second prize, etc.:

1. **General appeal.**
2. **Originality and uniqueness.**
3. **Practicability.**
4. **Ease of construction.**

All entries must be accompanied by sketches from which we can make finished drawings.

Photographs, while not necessary, are highly desirable and will count in the judges' decision.

Address all entries to Handicraft Editor, Science and Invention. Entries must be in our hands on the 15th of the third month preceding date of publication.

The opinion of the judges will be final. In event of a tie, an award identical with the prize tied for will be given to each tying contestant.

The prizes are as follows:

1st Prize—$25.00.
2nd Prize—$15.00.
3rd Prize—$10.00.
4th Prize—$5.00.

Other entries accepted and published will be paid for at prevailing space rates.

The dumping operation is simple. The load is run out on an inclined track and the stakes are knocked from under the logs.

The pole road builder yards and lays the rails as it proceeds. It costs about one-fifth as much as steel railroad to build, and the cost of upkeep is negligible.

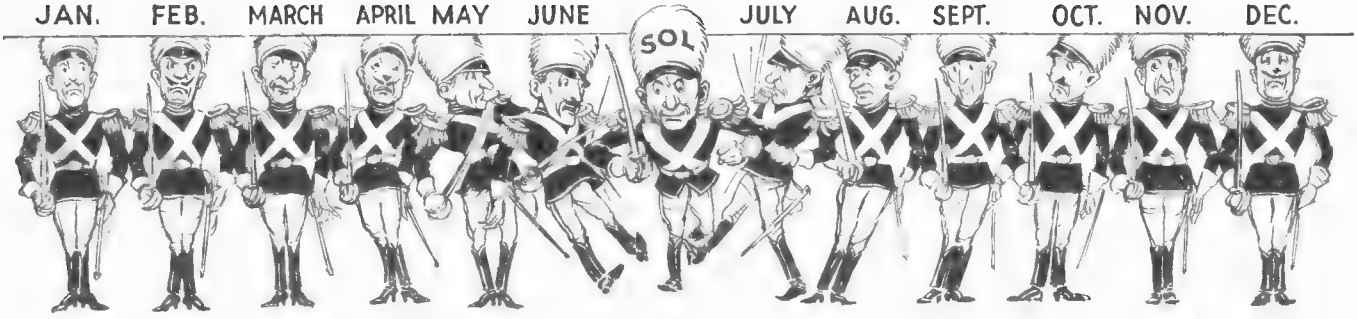
This 12-wheeled rubber-tired tractor hauls 60 tons of logs to the mills over pole rail tracks.

Logging Goes Automotive

By Lawrence Wm. Pedrose

RECENT years have marked a revolutionary change in logging methods in the Pacific Northwest, due largely to the development of more efficient machinery and more economical practices. Internal combustion engines are rapidly replacing wood-burning donkeys and coal-burning locomotives, and the influence of automotive science is further seen in the application of rubber tires to cars and trucks used in heavy hauling. Because of the change in power plants, effective means of controlling fires—the most destructive enemy of timber—have been found. Rubber tired gasoline locomotives, drawing rubber-tired cars and trailers on tracks made with pole rails, haul gigantic loads of logs weighing as much as 60 to 70 tons.

Singularly, loggers of today are hauling logs with methods generally used three-quarters of a century ago when bullteams furnished the principal motive power, and by utilizing modern high-speed machinery, are finding them profitable. Pioneer loggers used pole roads on which they ran great flanged wheels. With these contraptions they logged the level country, but in extending operations into the hills, they were compelled to turn to the skid road. Steam donkeys succeeded bull and horse teams and were later replaced by locomotives. Railway systems, however, necessitate huge investments and the upkeep is expensive. Economic need drove the loggers back to the ancient railroad of poles, and the application of rubber tires provided braking means for mountain country.



We're on Our Way to a 13-Month Year!

By John DeQuincey

IF you should retire some Saturday night and waken the next morning to find it wasn't Sunday, what would you think? Well, that is just what would happen the last Saturday night of every year if a certain new calendar, invented by Moses B. Cotsworth, goes into effect. And "Big Business" is really very much interested in the plan.

During the past nine years the movement to change the calendar has gained increasing headway. In 1921 the International Chamber of Commerce passed a resolution urging calendar revision. In 1922 the International Astronomical Union studied the question extensively. In 1923 the League of Nations appointed a special committee to investigate the matter. At the end of three years this committee recommended that national committees on calendar simplification ought to be appointed in every country. Such a committee was appointed in America in July, 1928; and George K. Eastman, kodak millionaire, was named chairman.

And thereby hangs a tale. About four years before, Eastman had met Moses B. Cotsworth, who was trying to interest the world in his calendar, and was soon "sold" on his new and ingenious system of time division. Instead of interesting himself in calendar revision in general, as various international bodies had, Eastman became an active hundred-per-cent supporter of the Cotsworth plan. Using the questionnaire method he circularized business leaders over the country, and reported an amazingly large majority of these men enthusiastic for calendar revision along the Cotsworth lines. As chairman of the national committee, Eastman further stepped up interest in the question by extended publicity.

Leaves Last Day Blank!

About the same time a bill was introduced in Congress authorizing the President to call an international conference on calendar revision. Extended hearings were held on this bill. Business men and noted scientists testified in behalf of the Cotsworth calendar. The probabilities are that this bill will pass at the next session of Congress.

Briefly, Cotsworth proposes to divide the year into 13 months of 28 days each. He would call the 13th month "Sol," and sandwich it between June and July. Further, he would begin each month with a Sunday, thus having four full weeks in each month. But 13 times 28 equals only 364, and there are 365 days in a normal year. What about the extra day that has proved such a nuisance to every calendar revisor? Cotsworth would just forget about it, calling it a blank day, so far as the days of the week are concerned.

You would have to use an adjustment table to find the equivalent dates in the new calendar, for every date after January 28 would be different. In other words, our present January 29 would be February 1 in the new calendar. July 4th would be Sol 17th, and orations would be delivered in eulogy of the glorious 17th of Sol!

Business men are enthusiastic about the new calendar because it will enable them to make accurate comparative statistics from month to month, for every month would have the same number of days.

However, if we have 13 months to the year, statements must be rendered and bills paid 13 times yearly instead of 12. Gas and electric meters will have to be read 13 times and the consumer will have the privilege of paying this extra cost. Monthly magazines

will have to publish 13 numbers. Either the advertisers or the subscribers will have to pay this. If the advertisers have to pay, then the price of baked beans and tomato soup will go up, which is a clumsy way of saying that the public will really pay. Worst of all, we will have to pay rent 13 times a year. Perhaps the landlords will lower the rent on this account. Perhaps! As to the social status of a man born on the blank day, we don't venture a guess.

Unless all signs fail, we are going to hear more about the Cotsworth calendar in the days to come. There is plenty of money behind the project and plenty of enthusiasm. Perhaps "Big Business" will save so much money by the new calendar that it will be willing to pay our 13th month's rent.

Let's Laugh

ALL jokes published here are paid for at a rate of $1.00 each; $3.00 is paid for the best joke submitted each month. Jokes should be scientific. Write each joke on a separate sheet of paper and add name and address to each sheet of paper.

THE NIGHT WAY

Rufus was proudly sporting a new shirt, when a friend asked—"How many yards do it take to make a shirt like dat one, Rufus?

"Well suh," replied Rufus, "Ah got two shirts like this out'n one yard last night."—*Matilda Klumpp.*

"WHAT HE HAD"

A medical student asked a surgeon:

"What did you operate on Brown for?"

"Three hundred dollars," replied the surgeon.

"Yes, I know," said the student. "But what did the man have?"

"Three hundred dollars," replied the surgeon.—*Rhea W. Ortmeyer.*

TRY IT

PASSENGER (in an airplane for first time)—I understand that I must hold on, but what if I fall out?

CRUEL PILOT—That's easy. Just grab anything you see and hold on.

—*Geoffrey Norman.*

ANSWER THIS ONE

PROF — Are there any more questions?

FRESHY—Yes, How do you determine the horse power of a donkey engine?

—*Leo Miner.*

JUDGING FROM TASTE

FIRST MAN—What do you think of these cigars? I got them from an airplane pilot.

SECOND MAN—What does he use them for—sky-writing?

—*Herbert Auer.*

First Prize $3.00

THRIFT

A man, running after a tramcar, asked the conductor:

"How much to the station from here?"

"Four cents," replied the conductor.

The man continued to run, and having covered another stretch, asked breathlessly of the conductor:

"How much now?"

"Six cents," answered the conductor, "you are running the wrong way."

—*Herbert Auer.*

FINGERPRINTS

I wonder how long it will take till they have the talkies in the deaf and dumb language.—*D. Andres.*

TWIN HAZARD

A very stout and portly gentleman was once asked why he did not play golf and this was his reason:

"I did try it once, but I found that when I put the ball where I could see it, I could not reach it; and when I put it where I could reach it, I could not see it."—*Bernard Proctor.*

THEY NEVER GET STALE

"The humorists may joke about the Christmas cigars a woman gives to her husband, but Tom enjoys those I gave him."

"How did you select them?"

"One by one during the preceding months from his supply. He doesn't miss them and then I save one of the empty boxes which I fill up with cigars I've taken and present them to him on December 25. The dear fellow doesn't know but that I purchased it at a store."

—*Agnes Anderson.*

THE WHOLE TRUTH

NEARSIGHTED OLD LADY (on river steamboat)—My good man, is this boat going up or down?

DECKHAND—Well, ma'am, she's a leaky old tub and she might go down, and then again, her bilers (boilers) ain't none too good, and she might go up.

—*K. W. Purdy.*

AN AUTHOR?

SOCIAL WORKER—What is your name, my good man?

CONVICT—Number 999.

SOCIAL WORKER — But that is not your real name?

CONVICT — No, only my pen name.—*Robert M. Jones.*

COMPARISON

CITY BOY (Looking at his first windmill)—Say, Uncle Tom, that's some electric fan you have out there cooling the cows.—*Tadashi Yemoto.*

HEREDITY

PROFESSOR—What is heredity?

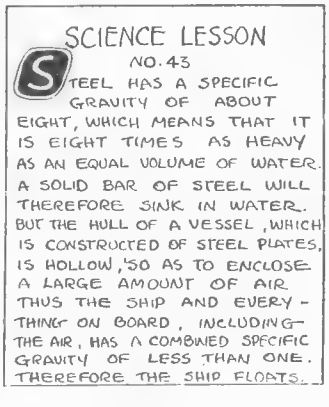
BRIGHT BOY—Something every father believes in until his son begins to act like an idiot.—*George W. Blum.*

NEVER MIND

"Oh John," sobbed the young wife, "I had baked a lovely cake, and I put it on the back porch to cool, and the d-d-dog a-a-ate it."

"Well, don't cry about it, sweetheart," he consoled, patting the pretty flushed cheek. "I know a man who will give us another dog."—*Clarence Huebschwerlen.*

Scienty Simon—*Scientist*


SCIENCE LESSON
NO. 43
STEEL HAS A SPECIFIC GRAVITY OF ABOUT EIGHT, WHICH MEANS THAT IT IS EIGHT TIMES AS HEAVY AS AN EQUAL VOLUME OF WATER. A SOLID BAR OF STEEL WILL THEREFORE SINK IN WATER. BUT THE HULL OF A VESSEL, WHICH IS CONSTRUCTED OF STEEL PLATES, IS HOLLOW, SO AS TO ENCLOSE A LARGE AMOUNT OF AIR. THUS THE SHIP AND EVERY-THING ON BOARD, INCLUDING THE AIR, HAS A COMBINED SPECIFIC GRAVITY OF LESS THAN ONE. THEREFORE THE SHIP FLOATS.

THE SAFETY

Conducted by

Readers' Opinions and Comments

His Second Model Trophy

I WANT to heartily thank you for the trophy cup which I received recently. I am more than proud of these two cups. Everyone who sees them is surprised at their size and beauty. Through the impression made on them by these cups many people have become readers of the magazine. Again thanking you. HARRY L. WOODSON,
St. Louis, Mo.

(Mr. Woodson has won two of the SCIENCE AND INVENTION *trophies for models. In this contest a cup is awarded for the best reproduction of an airplane, steam engine, a motor - boat, a locomotive and in fact every conceivable structural replica. Drawings must accompany the article so that others interested in the art of model making can follow the plans and duplicate the results. Finished drawings are made by our own staff of artists.*

If you are a model enthusiast and you want to be able to boast of winning a cup in this interesting competition, just crate your model and forward it, together with drawings. All models are returned to the owners.—EDITOR.)

Artificial Snow

ABOUT a year ago you published an article on an indoor ski track in which mention was made of artificial chemical snow. I am interested in carrying on experiments along this line and would be appreciative of any assistance.
ALFRED C. HECKLE.
New York City.

(A patent has recently been taken out by Ralph W. Simpson, of Joliet, Ill., the number of which is 1,746,717, which covers several means of producing artificial snow. One of the methods consists in preparing a solution of 10% sulphuric acid and 90% water, applying heat to bring the solution to a boiling water, and adding calcium sulphate in the proportion of 25% to 75% of the mixture, agitating, then filtering out the insoluble material, and cooling to crystallize the calcium sulphate. The crystalline substance is then dried. For further information we would refer you to this patent.—EDITOR.)

Fire Balls

I WAS greatly interested in fire balls or ball lightning, having lived where these are fairly common, and I thought it would be great if your magazine could give us some light on the subject.

In Jubbulpore, India, in 1909, my husband and Mrs. Goldstein sat, one on either side, of the open door leading into the veranda from our drawing-room, which was about 25 feet by 20 feet in size and 20 feet high. The open door was on the rounded side of the room and the other walls were straight. The house was a one-story bungalow with covered veranda all round. Directly above my husband's head and that of Mrs. Goldstein was a window in the upright walls and near the ceiling.

From my place at the piano (which I was playing), in almost the middle of the room, I had a good spectacular view of what happened when a "fire-ball" passed through the room.

For about an hour that afternoon we had observed sharp fork lightning around us and thunder at long intervals, but no rain.

Suddenly, without warning, a fire-ball about the size of a football fell in through the open skylight on the left, rushed with a hissing noise down to within a foot or so of the plaster flooring, made a horizontal dash along the room, passed between Mrs. Goldstein and her eighteen-month little son, who stood a few feet from her, and rushed up again to the skylight on the right over my husband's head and passed out.

The child, Vernon, dropped instantly flat on his face when the "fire-ball" passed him and was inert and lifeless for ten minutes afterwards. Then he woke up as if dazed from a sleep and did not appear to remember what happened, but played about normally.

Also, when the fire-ball passed along the room, the piano strings loudly vibrated in rapid succession up the scale. My hands were not on the instrument at all. The fire-ball was seen by others to leave our roof, and it passed up but fell again about half a mile away, killing a cow and smashing a big copper vessel used for milking.

I was greatly interested in this curious phenomenon and went to inspect the place with my husband and Mrs. Goldstein. It had killed the cow, but there was no sign of external violence, and had struck the copper "chattee" or bucket with great force, doubling it up and partly burying it in the mud floor of a hut. It seemed to adhere to the vessel, which looked to my unscientific eyes just like rough iron ore with rusty spots. The fire-ball in passing looked like a meteorite, of distinct sky-blue tint and left a tail of light which shaded from blue to yellow.

I have often wondered why did the piano resound in that particular way and why did the fire-ball pass the open door and rise up to the other skylight?

Another case happened in Nicholson, Ontario, when several persons were seated round the supper table. The fire-ball came through the door, whirled around several times, breaking the mirror in the buffet and some china and glass, and then careened around the electric light over the table in the center of the room. One man drooped forward and remained in a coma for a long time, but no one was hurt or killed, though terribly frightened, while dodging the luminous ball. It went out again by the same door it had entered.

Last year, in the same station, a fire-ball ran along a clothes-line wire stretched across the yard and terminating just above the front door. At this time a woman stood in the doorway and the ball ran along the line down to the woman and killed her instantly.

No close observation was made of these latter two fire-balls.
MABEL C. WAY-WHITE.
Chapleau, Ont., Canada.

(Many contributions have been made to the literature on fire-balls. Your observation of these will undoubtedly add interesting literature to that already existing. We thank you very much for this addition.—EDITOR.)

Shoot if You Must

I DO not like to doubt your word, but what you and David Watkins said in (2350) about the rifle sounds quite queer.

If your answer is correct, why then did so many of our aviators get killed in the World War from a machine gun on an aeroplane going over 100 m.p.h.?

And another thing I am safe in saying that you are afraid to get on the track right after a train has gone by at 100 m.p.h. and let me shoot a rifle at you from the train.
ROBERT BOCK.
Erie, Pa.

(Our Radio Editor, Mr. Brown, will be very glad to stand on the track and let you fire a rifle at him, but we have two conditions to make. The first, that you will get on a train actually going at 100 miles per hour, and second, that you will produce a rifle that has a muzzle velocity of 100 miles an hour.

The game cartridge, a 110-grain bullet, when fired through a Springfield rifle, has a velocity of 3,500 feet per second. This is approximately 500 feet faster than the fastest military rifle bullet velocity. The slowest bullet velocity is obtainable from a 41 short rimfire cartridge when fired through a Derringer pistol. This has a velocity of 500 feet per second. Its effective range is about 20 feet, due primarily to the difficulty in aiming the pistol, which fits the palm of the hand. These figures were given by the Remington Arms Co., who make not only rifles but also the cartridges to fit them. They also manufacture an air rifle which was described some time ago in SCIENCE AND INVENTION *Magazine, which has a muzzle velocity of 250 feet per second. If this velocity could be maintained it would be equivalent to 175 miles per hour. It therefore follows that, even if you got on a plane traveling at 100 miles per hour, you could shoot a man who is standing still with a pellet fired by an air rifle. If the man was receding from you or traveling in the opposite direction, in another plane also going at a rate of 100 miles per hour, you could not possibly hit him with the pellet from such an air rifle.*—EDITOR.)

VALVE

Joseph H. Kraus

Will Be Welcomed by the Editors

More About the Theronoid

A FEW days ago I read an article in your magazine, March issue, on page 1017, in which you say that the Theronoid is wholly worthless to the human body. It just happened that I bought a Theronoid a few hours before I read your article for which I paid $15 down, and the balance of $60 I have to pay in five months. I cannot afford to spend this amount on anything worthless and would not care to pay the balance on it, if it is what you say it is. Therefore I wrote directly to the Theronoid Company the same day I bought it, and same day I read your article. Am enclosing the reply I received.

Will you please let me know what you know about the Theronoid? I would appreciate any information you can give me.

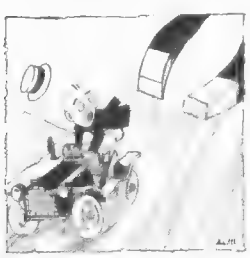
MRS. HORACE T. GRANT,
Cranmoor Manor, Toms River, N. J.

(*We would refer you to the following issues of* SCIENCE AND INVENTION *Magazine that contained material on Ionaco and Theronoid: October* 1927, *July* 1928, *September* 1928, *February* 1929, *August* 1929, *September* 1929, *and March* 1930.

Even though the communication from the Theronoid Company stated that "such assertions as are made by SCIENCE AND INVENTION *and various other magazines from time to time are made upon the experiments of two men over sixty years ago, by the name of Peterson and Kinelly, who experimented with Electro-Magnetism on a direct current deriving little or no response from the same," we would advise that we have conducted a series of experiments on these devices in* 1927 *and since that time. The articles were the results of conclusions at which we arrived, and had nothing to do with the Peterson and Kinelly experiments. We would like to hear from more readers who have not been helped by magnetic belts.*—EDITOR.)

California's Magnetic Hill

I RECENTLY saw a letter in a newspaper relating to the magnetic hill near Beverly Hills, California. The writer claimed that this was not an optical illusion, because six years ago he toured California and upon hearing about this hill, he wanted to see it for himself. Six indviduals then got into a touring car and drove to the bottom of the hill. Then starting at the bottom with the motor shut off, they coasted up the hill, very slowly, of course. When the car had rolled uphill for thirty yards, the brakes were applied, the car turned around, and then the brakes were released to see if the car would roll downhill. Instead, the car started to go uphill again, backward, and it was necessary to use power to go down to where the car originally started. It was claimed that a story in a Los Angeles newspaper said the engineers thought the road contained magnetic ore beneath the surface, and it was this magnetism that caused the cars to roll uphill.



Will you please explain how this is possible?

CHARLES F. HYBA,
Chicago, Ill

(*It is a peculiar thing that in the same portions of the "magnetic hill" where a car is said to roll uphill without any power, a rubber ball placed on the roadway also is said to roll uphill. Magnetism has no effect on a rubber ball, and any magnet powerful enough to pull a car and load up a grade would have to be strong enough to make itself felt for hundreds of miles in all dircetions.*

The U. S. Coast and Geodetic Survey knows of no position in the United States where there is such a marked magnetic disturbance created on even such a sensitive instrument as a compass. It is true that there are magnetic variations of a compass in different parts of the country, but there is no place where the needle points east and west when it should point north and south. No type of magnetism has as yet been discovered which will affect a rubber ball or a wooden ball. Again we say, this is purely an optical illusion.—EDITOR.)

Built a Lamp

ON opening my copy of SCIENCE AND INVENTION for February, 1929, I came across the lantern type floor lamp, wood turning, article No. 8, and I liked it so that I immediately wanted to make one. Not having the necessary specified material, but having a lot of small pieces of mahogany, I decided to make the lamp up out of these, using in all eighty pieces, roughly ¾" thick, and of course the necessary size to turn up to the different diameters given in the illustration of the article No. 8. Taking each piece separately, I struck the diameter with dividers and then rough tramsawed them and drilled a half inch hole in the center of each piece. Then I got a piece of half inch cold rolled steel two inches longer than piece B in illustration and threaded each end about 1¼ inches for a half inch nut and centered each end for lathe. Then to make sure I got good joints I faced up the side of each piece in the lathe, using a half-inch mandrel on which the pieces fitted good and tight. When gluing and in order to prevent the pieces sticking to the rod, I made up paper tubes fitting loosely over rod. Then I made holes in pieces 1/32 inch larger with reamer, so as to slide easily over paper tubes. Then I took each piece and marked a square line from one side in the center of edge grain. Then I put on one nut with washer, slightly under finished diameter. I then took my first piece, put it on the rod and gave the face a coating of LePage's glue. Second piece followed.

Now watch your line on first piece and twist second piece ¼ inch from that line, using the line on second piece to guide you. Third piece the same, keeping the line on it ¼ inch from the line of second piece. In other words, twist each piece a quarter inch from center of edge grain. In this way, when turned up, a beautiful spiral effect is obtained by the shadow of the grain. Now put on washer and nut and tighten up and be careful the twist doesn't alter. Twenty-four hours after, place between centers and turn up. Be very careful to take light cuts for a start: otherwise the short grain is likely to split. The total cost of this lamp to me was $1.65 as follows: 65c. for electric socket and wire; 50c. for French polish and 50c for parchment. I can assure you this lamp is the envy of all my many friends.

E. DURLING,
British Columbia, Canada.

(*We are pleased to add to the series this method of building a lamp for the benefit of others who are anxious to use up scrap pieces of wood and get artistic effects.*—EDITOR.)

The Houdini Message Again

I HAPPENED upon your publication, "Houdini's Spirit Exposés" by chance. I am really interested in your book about Houdini, but I have a recollection of some "ghost" magazine advertising that Mrs. Houdini had received the message. Will you explain? Spiritualism to me has brought nothing but sorrow.

MRS. NEILS. MILLER,
Bowbells, N. D.

(*It is true that Mrs. Houdini claimed to have received the message that was agreed upon between her husband and herself. This message was delivered by a Mr. Ford, a spiritualistic minister. The April, 1929, issue of* SCIENCE AND INVENTION *Magazine contained an exposé indicating the manner in which this message was obtained.*

Let us listen to what Mrs. Houdini had to say to a United Press representative and others at Miami on March 18th. After first assuring the reporters that she had abandoned all hope of communicating with her husband in the spirit world, and that she had sought to penetrate beyond the grave for three years and tried to communicate with her husband in every possible way, she added:

"I hoped and prayed and worked to get a message from Houdini, and several of the great spiritualistic advocates declare I have succeeded. But it is not true. The silence is impenetrable. There is only a void. If I had succeeded in communicating with Houdini, I would shout it from the housetops; I would carry a message of hope to all burdened souls; but I have none. There is nothing there."

She then steadfastly denied that any of the mediums presented the clue by which she was to recognize a legitimate message.

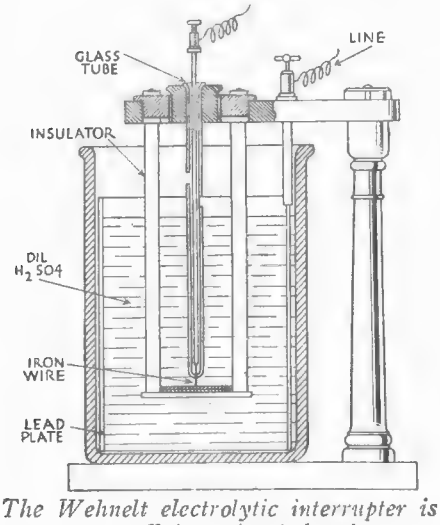
We wonder what Mr. Ford has to say to these statements. We wonder what the reply of the spiritualists will be.—EDITOR.)

The Oracle

For the Home Electrician

(2356) Erwin LeHarve, Owosso, Mich., writes:

Q. 1. I recently purchased a used Scheidel radiographic coil. What type of electrolytic interrupter is most suitable for use with this coil on 110 volts?



The Wehnelt electrolytic interrupter is a very efficient circuit breaker.

A. 1. There are many types of electrolytic interrupters. One of the most efficient is the Wehnelt. This may be easily constructed at home, if one follows the diagram shown above. The action of the interrupter is as follows: The lead plate acts as the cathode and the iron wire as the anode. The anode projects for a fraction of an inch into the acid and is regulated by a thumbscrew on the cover of the instrument. The passage of a direct current through this interrupter causes a film of hydrogen gas to form around the end of the wire, breaking the circuit. As no condenser is used, the "extra" current—self-induced in the primary of the open core transformer—discharges in the form of a bright spark, causing a further recession of the acid from the wire point. The acid almost immediately flows back in contact with the anode and in this way "breaks" and "makes" follow each other in rapid succession. One of the wires from the interrupter is connected to the line and the other to the apparatus in use.

The Firefighter's Headache

(2357) Charles S. Stone, Iowa City, Iowa, writes:

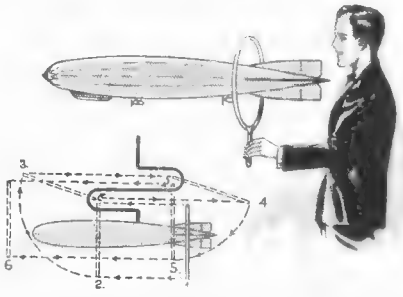
Q. 1. The newspapers often give spontaneous combustion as the cause of fires. What is spontaneous combustion and what causes it?

A. 1. Spontaneous combustion may be defined as the ignition of a combustible material without the application of external heat or light. The heat generated by oil-soaked cotton confined in a poorly ventilated room sometimes becomes sufficient to ignite the cotton. Coal mines are one of the most popular places for the starting of fires due to spontaneous combustion. This is due chiefly to the rapid oxidation of coal dust when it comes in combination with air. There is very little known about the exact cause of spontaneous combustion in organic matter. It is generally believed that the initial heat is generated by micro-organisms,

The Mysterious Zeppelin

(2358) Murray Garvey, St. Louis, Mo., writes:

Q. 1. Recently I saw a novel window display of a well-known radio manufacturer. It consisted of a model Zeppelin, apparently without any means of suspension, about which a hoop was moved,



Passing a hoop about an apparently unsuspended Zeppelin is accomplished by the means shown in this diagram

so that it seemed that there was nothing holding the Zeppelin on the side not seen by the passers-by. Can you tell me how this trick was accomplished?

A. 1. This, we believe, is a modification of the old levitation trick used very often by magicians. It consists of a wire support bent into the form shown in the diagram above. One end of this support is inserted into the Zeppelin and the other into the wall. The hoop is moved by a machine, so that it follows the path as indicated by the arrows in the diagram. The hoop starts at position marked as 1, continues along this path to 2, and then swings around to the position 3 and back to 4. By the time it reaches 5 it is in a position to pass over the end of the Zeppelin entirely, and so anyone viewing it thinks there is nothing behind the Zeppelin.

The Oracle is devoted to questions of general interest. Write legibly on one side of paper. Send diagrams or sketches on separate sheets. A nominal charge of fifty cents is requested from those who desire a quick answer by mail.

This Is "Knot" for Sailors

(2359) John W. Hanson, New York City, N. Y., writes:

Q. 1. Can you give me some details about the origin and use of the word "knot" in nautical terms?

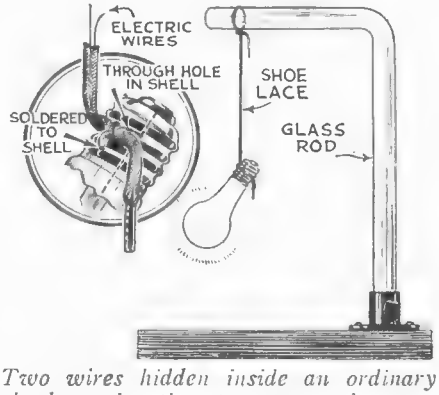
A. 1. The knot is the unit of speed equivalent to one nautical mile in an hour. The knot is the survival of the earliest practical method of ascertaining the speed of a ship. This method consisted of casting out a log-line with a triangular piece of wood weighted with lead attached to the end to keep it upright and retard its passage through water.

The line was divided into sections called knots because they were marked by pieces of cord worked in between the strands. Each knot was 47 feet 3 inches apart. A nautical mile is one-sixtieth of one degree of the earth's equator, or about 6,080 feet. Therefore the number of knots that ran off the reel in twenty-eight seconds (this having the same relation to the hour as the knot to the nautical mile) showed with fair accuracy the number of miles the vessel was sailing an hour. The "knot" as a unit of speed has been retained, but the old method of measuring the speed has been replaced by automatic logs which register on dials.

A Shoestring Conducts a Current

(2360) Charles H. Walker, Augusta, Kansas, writes:

Q. 1. Several years ago, when your magazine was known as the *Electrical Experimenter,* I came across a novel trick with an electric-light bulb which attracted much attention in a store-window display. It consisted of a wire passed through a shoestring and soldered to the shell of an electric lamp. I cannot remember where the return wire was placed. Can you help me in the matter?



Two wires hidden inside an ordinary shoelace give the appearance of a one-wire circuit.

A. 1. The method of completing this trick is quite simple. Two wires are passed through the shoestring, which is knotted about the shell of a bulb. At the point where the string is knotted on the bulb, one of the wires is soldered to the shell of the lamp and the other passes through a hole drilled in the shell and is soldered to the wire underneath the shell. In order to do this, it is only necessary to soften the solder connecting the shell to the bulb and remove the shell in order to drill the hole through it.

Europa—New Queen of the Seas

By George R. Brown

(*Continued from page* 109)

r.p.m. of the propellers. The turbines are completely protected against loss of blades.

Steam is generated in oil-fired water-tube boilers, and electric power is generated by four large Diesel-driven dynamos supplying current to 420 electric motors of various kinds and an equal number of auxiliary machines. The ventilating machinery is required to circulate 3,200,000 cubic meters of air per hour. For emergency use the regular lighting plants are supplemented by two large Diesel-driven dynamos located on the sun deck.

We have it on the advice of a builder of many ships that the hull of the Europa is a masterpiece of German skill, thoroughness and workmanship. However, there is nothing new or radical about the highly-touted bulbous prow, which creates dead water about the propellers so that greater power is realized. This type of bow has been used for the last ten years in the construction of cruisers for the American navy. In spite of the fact that added power is realized from this type of bow, the Europa loses a lot of its potential speed due to her large draught.

Much has been done in the interests of safety, not only above the decks in such features as motorized lifeboats holding 145 passengers, equipped with radio and non-sinkable, but below the decks in fourteen watertight bulkheads which divide the ship into fifteen separate waterproof compartments. In addition the ship is equipped with the usual instruments for safe navigation, including, radio direction finder, submarine signals, echo sounding apparatus, and other devices.

Radio transmitting and receiving apparatus designed by the Telefunken Company keeps the Europa in constant touch with both continents. Six separate antennæ operating on one long wave and two short waves flash daily reports to the home offices. In addition a complete ship-to-shore telephone service similar to that of the Leviathan, described in the March issue of SCIENCE AND INVENTION is available for all passengers.

Jumping Motorcar Contest Award

In our March, 1930, SCIENCE AND INVENTION, we described Schneller's Jumping Motorcar, on page 1008, and invited your opinions as to its scientific soundness. Of the many letters received, the Editor believes the following one best describes just what is wrong with the car. Mr. John F. Dreyer, of 345 Thrall Street, Cincinnati, Ohio, the writer, therefore receives our $10.00 award for the best letter submitted.

"The set up is too sensitive to atmospheric conditions.

It travels too fast to be controlled during short run flights

It cannot be precisely aimed. Witness the big guns.

It is sensitive to load and load distribution.

It can be tested out only by destructive trials.

It does not compare favorably with existing substitutes as to weight, size, cost of transfer and safety.

It has many operating difficulties to be overcome as: twisting, slippage, positive application of power, driving wheels synchronized to give acceleration, also means of operating the wings, and at the correct time."

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PATENT ADVICE

CONDUCTED BY JOSEPH H. KRAUS

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail, a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

Spring Wheel

(1218) C. W. Hedges, Pittsburgh, Pa., asks:

What is your opinion of an airplane landing wheel which wheel uses strong coiled springs instead of spokes to eliminate most of the shock in landing?

A. 1. It has been definitely ascertained that no type of spring, pneumatic or other form of spoke, will absorb the shock as well as the present style of shock absorbers combined with the pneumatic tired wheels. Many attempts have been made to make a solid tire ride like a pneumatic by substituting spring spokes for the solid spokes. The attempts have been far from successful. We advise no action.

Ship Propulsion

(1219) A. Freer, New York City, N. Y., writes:

Will you please inform me in your Patent Advice columns of the various methods of ship propulsion, either patented or experimented with. Are there any methods other than the paddles, screws, sail, and the rotor towers?

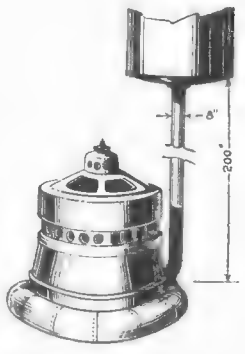
A. 1. In order to cover them all it would be necessary for you to have a patent search made. Any reliable patent attorney can do this for you. In addition to the methods that you have outlined, we would advise that articles on various other forms of ship propulsion have appeared in this magazine. Air has been used; rockets have been employed; waves have been utilized and their force directed against a series of vanes; a ship has been broken up so as to produce a segmented form, lashing flexible appendages have been added so as to simulate a fish's tail; long spirals extending along the entire length of the ship have been used, and water has been sucked in at the bow and forcibly ejected at the stern of the vessel to afford propulsion. These are only a few of the many suggestions that we can recall off-hand.

Super Power

(1220) Jerry P. Priamos, Lomita, Calif., would like to know if fresh water coming down from a tank through a pipe 200 feet long and 8 inches in diameter can run a generator to generate elecricity enough to run a 500 horsepower electric motor. If not, he wants to know how many horsepower such a system would generate.

A. 1. It is quite difficult for us to give you some accurate figures on the horsepower that you could develop from a tank containing 25,000 gallons of fresh water with a long penstock 200 feet over all. The reason for this is that one must also calculate the amount of water in the tank so as to get the over-all head. If your tank is 10 feet deep, then your head of water is 210 feet. However, we are making clear the method of calculation so that you can figure out the problem yourself.

A gallon of fresh water weighs 8.337 lbs. Inasmuch as you are going to discharge 2,500 gallons per minute through your penstock, you multiply this figure by 2,500, which gives you the figure 20842.50 lbs. at the outlet. We now must multiply this figure by 200 so as to give us the effective head. This will give us 4,168,500. This figure is then divided by 33,000 so as to give us the horsepower per minute which calculations indicate would be 126.31 horsepower. Inasmuch as the efficiency of a water turbine is 75 to 80%, we develop 101.048 horsepower, using the 80% efficiency figures for the turbine. A generator of this size will also develop approximately 80% efficiency with the result that the generator will probably develop 80.83 horsepower.



Multiple Filament Lamp

(1221) Joseph X. Labovsky, Wilmington, Del., asks for advice on the possibility and validity of a multiple filament incandescent lamp in which the filaments are arranged in parallel to prevent the sudden failure of light, should any or several of the filaments oxidize.

A. 1. In view of not having made a search on this particular product, we are not in a position to definitely advise you as to its novelty. You would have to have a search made upon this suggestion. We are of the impression that a lamp constructed as you have indicated is more liable to breakage than the present styles. While it is true that if one filament should happen to burn out completely, the lamp would still retain its luminosity, there are several other and more important factors involved. Should this lamp filament short across several of the other filaments when breaking (and this is usually the case on filaments of this type), there would be a lowered resistance of a portion of the filament with an increased surge in the part not shorted, or shunted, and a second filament would burn out.

For a 25-watt lamp, each individual filament would have to have a resistance of 440 ohms and if ten filaments were employed, each filament would have to have a resistance of 4,400 ohms so as not to increase the current consumption.

At the right is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ.

PATENTS

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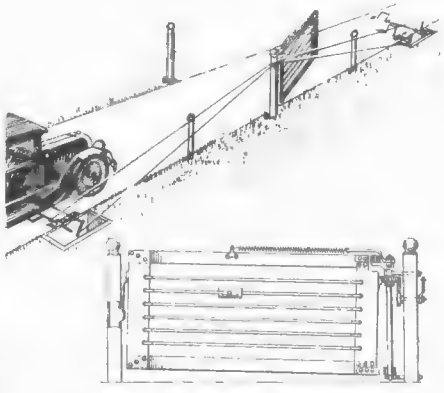
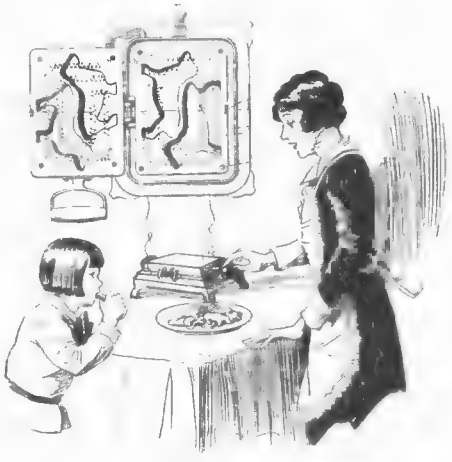


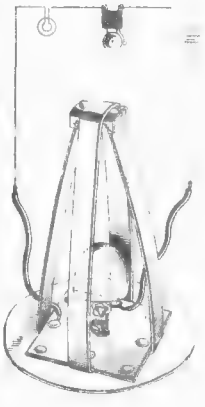
A New Way to Crash the Gate

No. 1,725,354, issued to Erasmus Jasbring. Relates to a means of providing an automatically operated gate. Comprises gate construction consisting of a hinge post, a pivot rod supported vertically on the post, a swinging gate with co-operating latch elements.



upper casing, and a molding plate detachably connected to the lower casing for partly closing the top. In addition a support is provided to aid in the complete closing of the top casing. The upper casing is hinged to this support by notches which fit into the supporting piece.

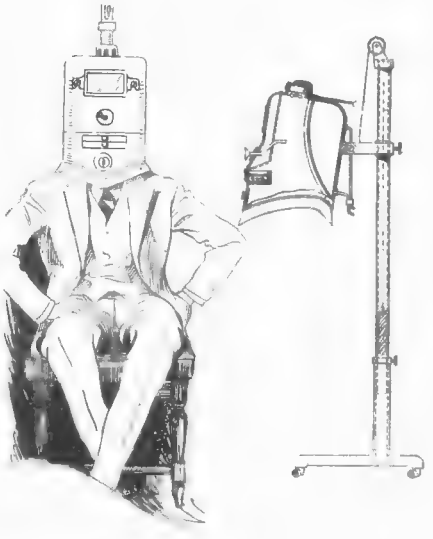
Complicating the Fireman's Life



No. 1,720,793, issued to Francis A. Kunkle. Pertains to improvements in heat-controlled circuit closers for use in alarm systems. Consists of a supporting member with V-shaped contact strips, meeting at median point at which is contained a fusible element.

Heads Up!

No. 1,705,467, issued to Victor P. Battenfeld. Refers to an appliance for heat treating of various ailments of the head, neck, and shoulders. Consists of a rigid hood with aperture in lower part. Hood contains an electric heating element supported on an inside shelf. In addition, the hood contains an evaporating tray mounted on top of the heater element.



Get 'Em Hot

No. 1,742,945, issued to Peter S. Banff. Relates to an electrical cooking device designed primarily for that type of sandwich termed "hot dog." However, it may be adapted for producing any article of food to which it is applicable. The invention consists of an electrical cooking device with an open bottom upper casing and an open top lower casing, each adapted to contain an electrical heating unit, a molding plate detachably connected to the

The City of Tomorrow Today

By Don Bennett

(*Continued from page* 131)

borders are motorways, from which driveways penetrate the park space, communicating with the motor entrances of homes. Between each two driveways is a narrower road devoted to foot traffic. While this footway affords exit to the motor road, its principal purpose is to afford access to the central park area of the super-block.

The park areas of the super-blocks are connected by tunnels under the motorways known as pedestrian under-passes. Thus it is possible for pedestrians to go from one super-block to another without crossing a motorway. This is especially valuable in that it enables children to reach school with absolute safety.

The methods employed in building Radburn are of particular interest to the engineer. For the first time, perhaps, well-designed substantial homes were erected on the basis of quantity production. Within a year almost 200 homes were constructed without duplication of effort, with smooth, harmonious interlocking of the functions of the various trades necessary to such construction. Each group of houses, varying in number from four to twenty, was built as a unit and the houses in any given unit neared completion at the same time.

The Process of Construction

I visited the site one day, and as we drove up the road we saw farmers cultivating the land in one corner of the prop erty. Keeping on, we reached a section bustling with activity. Four steam and gasoline shovels scooped out cellars by the cubic yard. Tractors hauled trains of trailers which received the excavated earth as it was dumped. As each trailer was filled, the tractor moved up a bit and placed the next where the scoop would let fall its load, and as soon as a train was filled it pulled away and another took its place. The full train chugged off to where a bit of the land, lower than the rest, was being filled with the earth removed from the cellars. There was no waste here. Across the "road"—now defined only by ruts of trucks and the peculiar track of the modern tractor—a truck was unloading a cargo of cement blocks. Laborers moving with their accustomed speed, which is so often likened to that of the snail, piled the blocks convenient to the masons, who were down in the holes just vacated by the steam shovels we had been watching. Here was the foundation, going into several houses at once.

In the background I saw a lumber pile and heard the musical whine of a saw. We walked over and watched a mill crew fabricating parts for the house soon to cover those nearby holes. A hundred pieces to this measurement, a hundred to that. Neat piles marked with key numbers. A group of laborers approaches one pile of long "three by eights" with a hand truck. The joists are laid across the cement blocks, evenly spaced. A group of carpenters descend on them and soon have the braces in, the flooring down.

Plumbers, electricians, lathers, painters —all the specialists—advance in order and place the sections for which each is responsible, going from one house to the next. Finally the whole group of houses takes shape and stands before you. All around are other groups of houses, each progressing through similar stages to completion.

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Hitch-Riding Through the Skies

By Captain Frank M. Hawks

(*Continued from page* 112)

in a snap of the fingers from doubtful Thomases to boosters. I have seen many of my contemporaries who thought they had enjoyed all the thrills and sports of aviation through power-driven airplanes turn to gliders like children to a new toy.

At the National Air Races in Cleveland, Casey Jones, "Speed" Holman, Lieutenant Boyden, Amelia Earhart, Reed Landis and I, contested in the licensed motor pilot's gliding race. I won. We were towed by a 500-foot cable attached to an automobile going at 25 miles an hour toward a given spot; the contest was to see who could remain aloft for the longest time and land nearest the mark. We all tried to gain high altitudes—mine was 400 feet and I stayed aloft (after being cut loose for my free gliding flight) for one and three quarter minutes, finally landing within thirteen paces of the set spot. We all had a glorious time and agreed gliding was a great sport, offering tremendous possibilities.

Gliders or soarers have a very important part to play in the development of aircraft and air transport. There are many ramifications to the use of the glider and one can visualize several possibilities for their use.

Primarily, the glider has two sound fundamental values. Unquestionably, it offers a very safe and inexpensive means to student aviators for instruction. The novice in flying gets a keener technique and a better knowledge of aero-dynamics. In the first few tender hours of flying he can learn a great deal more with a glider than with a power-driven plane. He is not depending upon the motor but is learning currents of air, the action of the controls; he is depending more upon real flying as it is taught to us than by sheer horsepower. Every landing that he makes is a forced landing because he has no motor, so his judgment in approaching fields and landing on marks is keener.

Safe Instruction

I am absolutely satisfied that under proper supervision instruction as given by use of a glider is far safer than in an airplane. The numerous first flights of the student never exceed ten to fifteen feet in the air and the little light gliding machine cannot possibly stall and fall very hard from that altitude so as to in any way injure the pilot. And too, a few of these slight mishaps are beneficial to him. They make him realize the possible dangers and he goes through all of the experience of slipping off on a wing, pancaking or nosediving without any injury. Most of us who learned in the early days have seen many of our friends go through these experiences and never live to tell the tale. In my experiences with gliding, I have seen many of these same incidents happen to the students—we all had a good laugh and joke about it and then the instructor could step forward and point out seriously to the student the subsequent penalty to be expected with a motor-driven plane for breaking some of the laws of flying.

The second value that gliding offers is one to aircraft manufacturers in the study of streamlines and wing curves. When one is endeavoring to soar, that is, fly over a terrain that is hilly and by use of the wind and air currents gain altitude and remain in the air for hours at a time; every little item of weight, streamline efficiency, wing curve, etc., is very important.

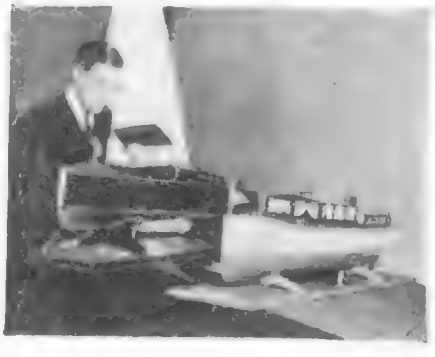
I believe 1930 is going to be a regular gliding year and we will see many marked developments. I hope to see thousands and thousands of people become interested sufficiently to join clubs, organize new ones and put over the glider program in excess of the bicycle craze of the nineties. I hope to see the 10,000 or more licensed pilots in the United States take a fatherly and sincere interest in gliders and put their shoulders to the wheel to act as supervisors and instructors. Undoubtedly the many clubs that will be organized will need this assistance and my last word in this article is to sound the only warning I think paramount and that is *all glider activities must be supervised by experienced individuals who know flying, its joys, its values and its pitfalls.* If the flying personnel of the United States take an interest in the newly organized clubs for the fledglings who are desirous of learning to fly and help them unselfishly, taking in return their share of the sport for sport's sake, they will be doing aviation an enormous amount of good.

Model-Making Men

By Mary Jacobs

(*Continued from page* 116)

On a summer day you can see them racing their power boats, sail boats, and schooners in Central Park. Here the first miniature one-cylinder, four-cycle, overhead valve, water-cooled, gasoline-driven power boat made 55 consecutive laps on the end of a tethered 50 foot cord. The boat, Clifton II, had been built absolutely to scale by S. Adolph Bosshardt, against the advice of Washington officials, who insisted that a gasoline engine built on so small a scale would never run. It was here that Elliott Zimmer, Bosshardt and Habl raced their craft. Mr. Elliott's B. G. E. powered with a Russell engine, won, with an average speed of 27 miles per hour. Now the boats go as fast as 30 miles per hour, and are completely equipped, like their "life-size" sisters.



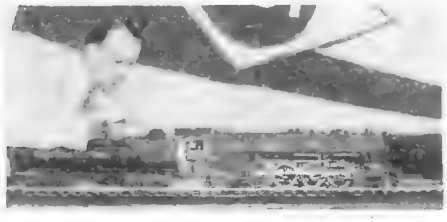
F. Schlirf surveys his steam-driven V-bottom power boat (to left), and four-sectioned A. C. F. cruiser, complete to the washroom.

Did you know that New York's highest office structure, the Chrysler Building, was modified from a 72-inch model, complete to the decorations on the pinnacle? Berthold Audsley called in Walter Chrysler and his architect after he had made the model, and Mr. Chrysler got down on the floor to inspect it.

Though the organization started in 1925 with four members who had no commercial intent, now, according to Walter Elliott, the Chairman, several members have gone into business, demonstrating the difference between their efforts and the so-called commercial models.

"We're constantly growing," said Mr. Elliott. "Yet, I remember how hard it used to be to get a man to admit publicly that his hobby was making toy trains. Everyone would work alone. Why, for eighteen years I've been interested in forming societies. Back in 1907 I was making models—airplanes, trains, anything. Only last week I took down one of my plane wings and threw it into the air. It glided beautifully. . . .

"Now our models are being used commercially very extensively. A replica of the Berengaria sold for $25,000; $100,000 was paid for a railroad unit. Minton Cronkhite is building a miniature, complete with cars, locomotives, stations and flags, of the Pennsylvania Railroad, to be exhibited at the Chicago World's Fair. This fair will have the greatest model display ever assembled for the general public.



H. O. Havemeyer, Jr.'s B. & O. Mountain Type Locomotive is being demonstrated by T. C. Tenniswood.

Aside from display purposes, models are used to produce a great saving. A car designer can see the lines of his car from a model and fix them before his product has been constructed. A fortune in tools, die making, and metal is saved. Models are used instead of complicated blueprints, they enable architects to visualize the finished skyscraper or apartment house without extensive redrawing.

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The editors have received thousands of different designs of perpetual motion devices, and have received hundreds of circular letters soliciting finances for the building of perpetual motion machines.

The editors know that if they receive these letters, there are thousands of others in this country who get similar letters and who fall for the claims made in the numerous prospectuses giving the earning capacities of the various machines.

Most of the shares of stock for these perpetual motion machines are being sold at a rate of $1.00 per share, although some inventors are trying to sell shares of stock at $100.00 per share.

Therefore, the editors of this publication say, "Just come in and show us—merely SHOW us—a working model of a perpetual motion machine and we will give you $5,000.00. But the machine must not be made to operate by tides, winds, waterpower, natural evaporation or humidity. It must be perpetual motion."

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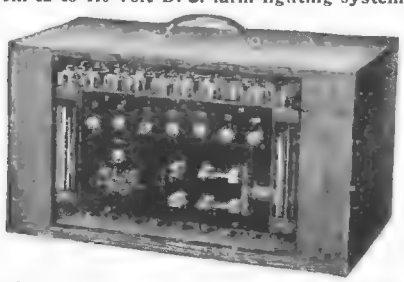

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Be Your Own Kitchen Engineer

By Mary Jacobs

(*Continued from page* 135)

sink, shelves for them near the range, help greatly in saving time. Tenter hooks for cups may be screwed into the under surface of the shelves.

Should you be planning a new kitchen, you may obtain a special cabinet with compartments specially built to accommodate everything—from mops to dishes to food. If you prefer a few smaller cabinets, why not have a broom closet built into the wall, so that you can keep all cleaning equipment together? And where space permits storing a good deal of food, put rarely used cans and foods on the top shelves, and those needed frequently on the bottom. It is a good idea to keep oversized pots on top shelves, too. If the storage space is a pantry and lies between the kitchen and dining room noises and odors will be cut off, but footsteps will be added.

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Light tile walls and cheerful linoleum brighten this well equipped kitchen.

Use open shelves for articles in constant use; while more convenient, they collect dust freely, so that curtained cabinets are quite necessary in conjunction with them. Don't have your shelves too wide apart, so that you must climb incessantly; or too deep, so that things will fall in back. Every kitchen needs an adjustable stool or combination ladder and stool to provide comfort in reaching for objects and comfort in sitting while working at different levels. Also be sure to have toe-room under tables and knee room under sink and worktables.

The Sink

The sink plays a great part in kitchen efficiency. A stain-resisting enamel with stainless chromium plated faucets can be obtained in almost any color. The average height of a sink for comfort is 36 inches from the floor, but as the shoulder and upper arm muscles are used extensively, a taller person should have one a little higher, a shorter person, one a little lower. The height may vary from 35 to 39 inches. Sinks may be purchased with hanging or adjustable legs. If possible buy an electric dishwashing machine, either portable or attached to the sink. It is quite essential, too, to have a garbage container clamped to the waste pipe under the sink, adjusted to a comfortable height. If placed on the floor instead, a foot pedal for the can is a great convenience. Placing the sink under a window provides the needed light and ventilation.

Windows and Ventilation

Food is constantly being cooked so the air must be changed frequently. Cross windows are advisable; otherwise have the outside door opposite a window to insure a through draft. And all outside doors should have a screened transom for ventilation, and glass in the upper part for light. Be sure that your work centers are adequately lighted—if there is not enough room for a full-sized window, why not a smaller one? Equipment may be placed underneath, so no space is wasted. Warm air collects at the top of the room and will be hindered in escaping unless the window extends quite near to the ceiling.

Besides windows an electric fan bracketed on the wall, about seven feet above the floor, out of the children's grasp, helps to move air from the warmest part of the room. A 100 to 200-watt light is sufficient for the average-sized kitchen. Diffuse the lights to prevent glare or working in your own shadow. Use frosted bulbs or translucent shades with fixtures on walls or the lamp hanging from the ceiling. A student lamp is excellent for work that requires close scrutiny. And have enough electric appliance outlets wired on separate circuits of heavy gauge wire to enable preparation of an entire meal at once. Waiting for toast to get done before your coffee can be percolated is no pleasure. And put the outlets at convenient heights. It's not necessary for the ironing board over two feet high to have its socket on the baseboard near the floor.

Cooking will be greatly simplified if you purchase one of the latest electric ranges, equipped with levers that automatically turn off at the set time. But whether you have a gas, electric or coal stove or range, have it near the sink and worktable and see that it is about 35 inches high.

Transfer food through a two-way pass closet between kitchen and dining room.

The walls should present a smooth surface, washable—tile preferably, or hard plaster covered with oil paint. Don't use plain white—it is glaring—use a yellow-gray or tan which will give color to the room and still be neutral enough to harmonize with the furnishings. If your floors are linoleum covered have the color scheme match with the walls and, in addition, use gay curtains of contrasting colors at the windows and cabinets.

Unkinking Cleveland's Traffic

By J. Gordon McKay

(*Continued from page* 115)

more routes into a single street. A number of the arterial streets carry a daily traffic of 25,000 or 30,000 vehicles each.

Modern traffic signal systems have been installed and are being enlarged each year. The progressive wave system is being applied on Carnegie Avenue, the main arterial boulevard to the east, and on parts of Euclid Avenue, the principal business street of Cleveland and East Cleveland.

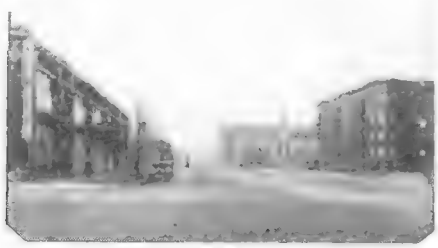
Although traffic speed is comparatively low in the central district of Cleveland, there are streets for passenger cars only on which vehicles can travel at speeds of 30 or more miles per hour from the edge of the business section into the suburban and rural areas. Segregation of passenger car traffic is especially useful in the case of routes serving highly-developed residential territory.

A Progressive Plan

Traffic is being furnished more and better highway service each year in Cleveland and the surrounding territory. In 1927 Cuyahoga County, which includes the City of Cleveland, made a thorough survey of its highway system with the coöperation of the United States Bureau of Public Roads, and adopted a ten-year program of highway improvement for the territory within thirty miles of the Cleveland Public Square. The plan includes:

1. Improvement of 468 miles of existing roadways.
2. Construction of 127 miles of new roadways.
3. Widening or replacement of 17 bridges.
4. Construction of 28 new bridges.
5. Construction of 69 railroad grade separations.
6. Construction of 6 highway grade separations.

Approximately one-third of the mileage of reconstruction and widening work, included in the first five-year period of this plan, has been completed. Since this mileage includes a large part of the major projects on existing highways, the state and county are now in a position to begin work on the most important of the proposed new routes



Widened section of Euclid Avenue Cleveland.

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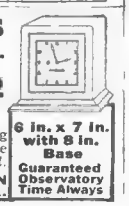

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New York–Bermuda Flight

Just before taking off for Bermuda from New York, Captain Louis Yancey, leader and navigator, W. H. Alexander, pilot, and our own Zeh Bouck (seated) radio operator, looked over the maps. This flight was the first of the season's long-distance over-water hops. It incidentally was the first time a plane ever came to rest on the ocean and took off again to continue the flight the following day. However, a pontoon was damaged slightly, forcing the party to return to New York by boat.

The plane Pilot, equipped with pontoons, leaving the waters of the bay at North Beach. Lack of wind made the take-off difficult. Two precious hours were lost in this manner.

The triumphant landing. Zeh Bouck (seated) was able to keep in constant communication with the New York Times radio station, the messages being sent out every minute. Just before night forced the plane down, reassuring messages were sent to the effect that the sea was very calm. The following morning, the Times station in New York again picked up radio messages from the plane's wireless operator. This set was designed by Zeh Bouck, who is connected with the Pilot Radio & Tube Company.

The short-wave receiver in the Times Building, where the operators were able to copy messages from the New York-to-Bermuda plane, is here shown. The receiving set on the plane was able to pick up the Times dispatches without any difficulty during the entire trip. The practicability of radio communication with planes was definitely established. In fact, the entire progress of the flight was traced by radio beginning ten minutes after the plane was in the air until it landed. Incidentally fears were allayed when the world was assured of a calm sea and safety of the crew when the plane had to be set down over night. The next morning found the intrepid flyers safe in the Bermuda town of Hamilton.

New Radio Set for Cars

New Set for Automobile Operation Gives Excellent Results. Controls are on Dash.

Automobile radios are now so arranged that they can be mounted on the dash of a car. The antenna is concealed within the top. The body of the car acts as a counterpoise. The tuning dial is within easy reach of the driver's hand.

In order to prevent interference, resistors and condensers, some of which are shown by the arrows, are inserted. The car radio thus gives pure music without objectionable static noises produced by spark plugs, distributor points, etc.

This Decorative Cat Is Easily Carved

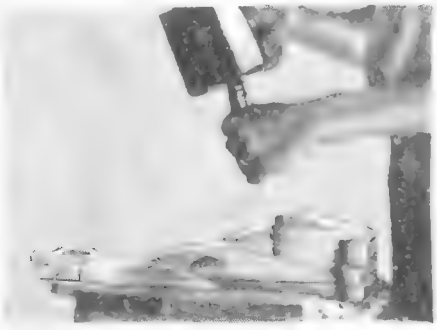
By Edwin M. Love

(*Continued from page* 150)

throat. It is only roughly shaped until the two halves of the cat are joined.

Rough out the head and paws.

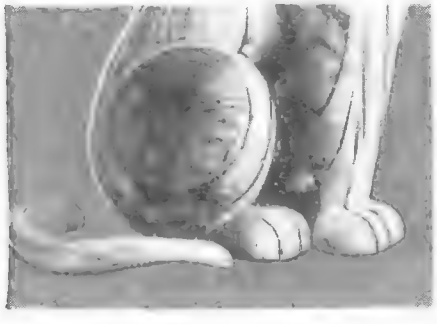
The two halves are now put together. Pry the piece apart with a chisel. Drive the nails back from each layer as lifted, and make a penciled circle around each nail hole in the one underneath. When all are apart, assemble again from the center out, painting a ¾ in. stripe of glue around the edge of each joining piece. Put the first two together, locating them by means of the first nails. Drive ¾-in. brads every two inches around the outside, and wipe off the squeezed-out glue with a damp cloth. Add the next layer, nailing every three inches with three-penny finish nails. The other layers are put on with larger nails, driven in the center as well as around the edges. The nails will show in the last pieces, so they must be set.



This illustration shows how the top of the thigh is roughed out.

To assemble the two halves, glue them, clamp together with hand screws, and toenail through the edges, setting the nails. It is not necessary to wait for the glue to dry before finishing the carving.

Smooth the breast and round the front legs. These are nearly flat as they approach the center line, and care must be taken, or they will be made hollow.



A close-up view of the tail which is to be subsequently attached to the cat.

The thighs are thick in front, quite streamlined, and slope off until they merge with the back. At the bottom they curve under slightly, as do the paws. No toes are carved on the feet, a smooth, clean curve in every direction being cut there.

Sketch the nose and brow lines on the head. These are parabolic in form, the nose sides coming out nearly straight, with a width at the end of ½ in. Round the end. Cut the sides of the nose ¼ in. deep at the bottom, the depth diminishing as it reaches the brow. Carve the cheeks, and round the nose corners. Draw the eyes, and outline them with a veining tool. Carve the eyeballs, rounding them until they bulge about 3/16 in. Continue the

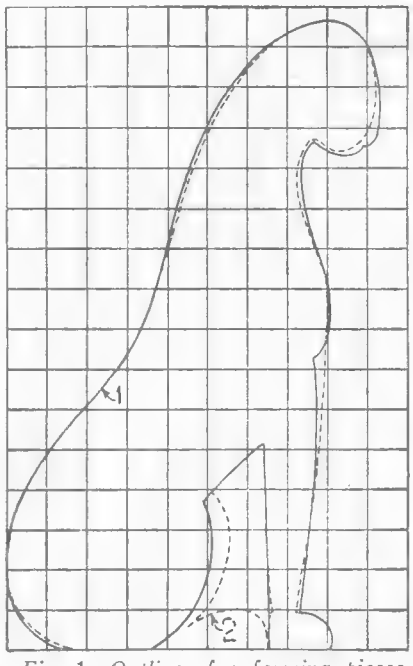


Fig. 1—Outlines for forming pieces 1 and 2 of the modernistic cat.

brow lines ¼ in. beyond, and cut the V-shaped pupils, which come to points ⅛ in. below the brows, and intersect with the lower lids, making the eyes look down, to agree with the head position.

The hollow fronts of the ears turn outward.

The Tail

THE tail remains to be made. Carve this from ¾ in. pine. Stand the cat on a board and trace the contour of the back and right hip. Sketch the tail for a width of 1¼ in., where it springs from

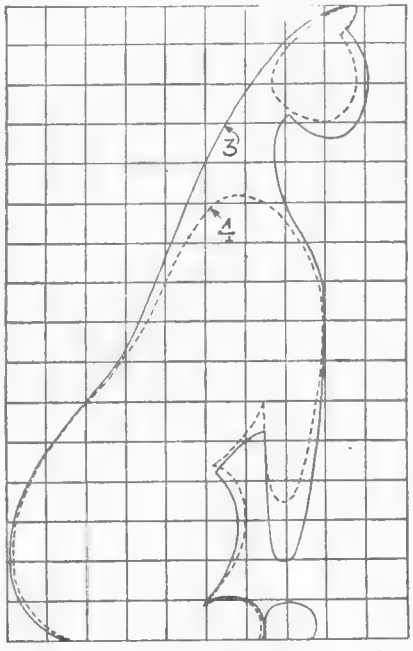


Fig. 2—Pieces 3 and 4 are made of ⅜-inch material.

the body, tapering to 1 in. This piece ends at the rear paw. Glue to its top another curved piece which is later carved to curl up over the paw. It will need to lap about 3 in. on the lower piece, so that it can be

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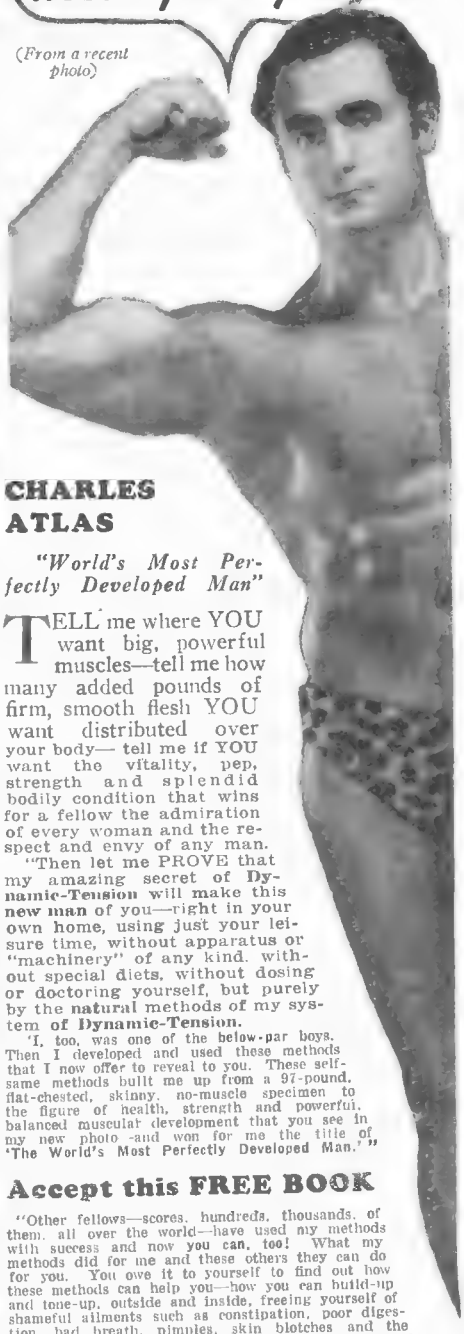

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curved up gracefully from the floor. A little care is needed in fitting the tail where it closes tightly against the body. When it will go up in place, shape the outside and nail it to the cat.

This is a design that is best when made

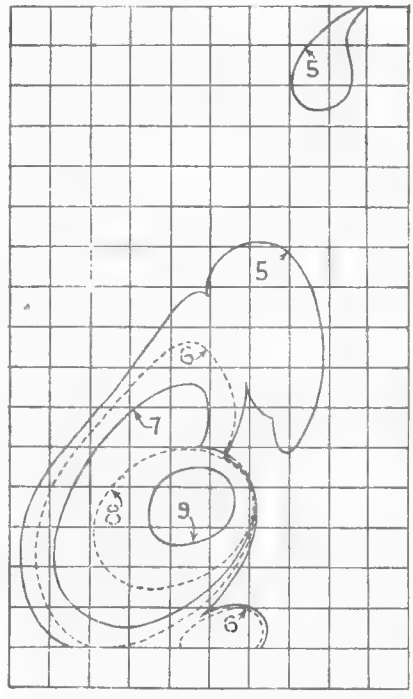

Fig. 3—The remaining pieces are indicated on this illustration. By checking with the half front and back elevation, the location of these pieces can be seen.

glass smooth, instead of showing tool marks all over, as is advisable for some carving. It is a tedious job to smooth the surface directly for painting, but with a good undercoat of plastic paint this can be done in quick order. First, go over the body with a wide chisel, reducing big

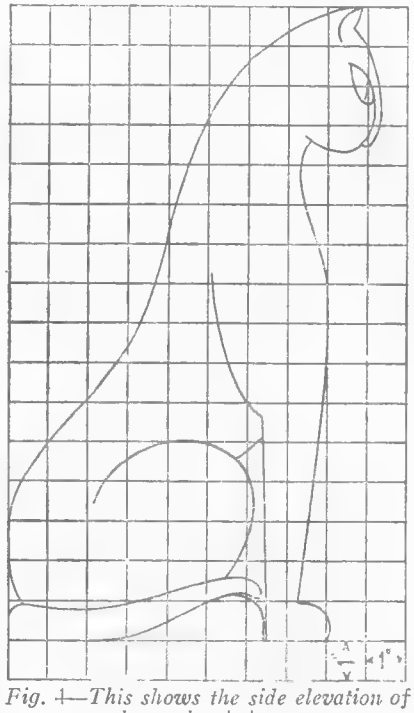

Fig. 4—This shows the side elevation of the modernistic cat.

cuts to little ones. Then work it over with a cabinet scraper, or broken glass, and scrub well with coarse sandpaper. In doing this, however, be careful not to flatten curves or to destroy the symmetry of the piece.

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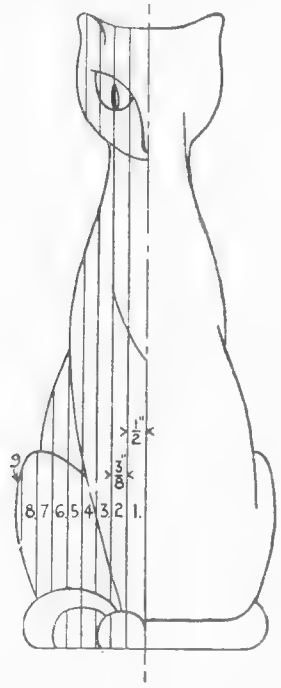
Painting

USING a small brush, paint two or three coats of gesso thinned to a creamy consistency. Let set for two hours or more, and pare off any glue that has been drawn from the joints. Give another coat of slightly thicker gesso. When dry, sand with No. 1 sandpaper. If there are any nail holes or other blemishes remaining, fill them with sealing wax melted in with a hot iron. Scrape these flush with the gesso when cold.

A final sanding with No. ½ grit should next be given. Let stand for a time, so that the fresh gesso uncovered in sanding may dry hard.

Two coats of paint are sufficient. Paint the eyes with a small artist's brush, being careful to get smooth edges at the eyelids. Paint the pupils black.



This is a half front and back elevation of the cat, showing how it is built to form this unique ornamental door stop.

St. Louis Buries a River

By Count A. N. Mirzaoff

(*Continued from page* 121)

an expert hand shoveler could move in ten hours. The powerplant is a Diesel engine of 240 horsepower, and the crew consists of an engineer and two helpers.

A mammoth concrete mixer was used which delivered 540 tons of concrete in eight hours. Mechanical feeding of this unit eliminated the necessity for forty men, 25 wagons, and fifty mules. Caterpillar tractors and trucks in every instance have been substituted for the long-eared hybrids. For resurfacing, five dragline excavators powered by 100-horsepower gasoline engines and one excavator powered by a 100-horsepower Diesel engine are used.

As far back as 1907 St. Louis ordered a survey of the meanderings of the Des Peres. It was discovered that floods had cost the city millions of dollars in damages during the previous fifty years. In 1915 a Gulf Coast hurricane blew up the valley and treated St. Louis to an entirely new demonstration of what the Des Peres could do.

Work on the "subway" project was started in 1924 and is now practically completed.

Book Reviews

ANTARCTIC ADVENTURE AND RESEARCH, by Professor Griffith Taylor, published by D. Appleton & Co., New York City, 238 pages with Index.

Admiral Byrd has done such wonderful work in the Antarctic that this book seems quite timely. A very striking map shows that the Antarctic continent, Anarctica by name, is far larger than the whole of Europe and that the great state of Texas would merely be a spot on the map. Here it is that the Byrd expedition spent their many months and risked their very lives by mapping its contours with the aid of airplanes. A striking thing about the southern pole of the world is that it is mountainous. The South Pole, in other words, may be said to lie on the summit of a lofty mountain, in great contrast to the Arctic regions, where there is a frozen sea. The book starts with the explorations of the eighteenth century, going back to the days of the French explorers who seemed to have been the first to do anything tangible, and then we come to Captain James Cook, the famous English explorer. And so the book goes on with subsequent explorations with very interesting maps showing just what such men as D'Urville, Wilkes and Ross accomplished. In the Arctic region there is a distinct race inhabiting it, the Esquimaux. They live on the countries bordering upon the Arctic Ocean, and in the Antarctic we have the great continent without a single human being indigenous thereto. The nearest approach to man are the grotesque penguins which at least stand erect. We are pleased to recommend this book warmly, and its value is enhanced by a quite adequate index.

NEW FRONTIERS OF PHYSICS, by Paul R. Heyl, Ph.D., published by D. Appleton & Co., New York City, 162 pages with Index.

From a leading physicist in the Bureau of Standards we get this quite remarkable little treatise. It is interesting to see the way in which Professor Heyl speaks of the Enstein theory, describing its immense complication, but telling what it has done, that it explains everything which Newton's law did, and that it has even shown powers of prediction, so that in Professor Heyl's words, "it has gradually compelled recognition despite its repelling appearance, solely upon performance." "Expressed by a set of ten simultaneous differential equations, each of so fearful and wonderful a structure that a most compact and unfamiliar notation is required to render it printable." The writer of this review thinks that harm has been done to the Einstein theory by the efforts at explaining it in simple terms. Slosson, the author of "Creative Chemistry," has undertaken to give it in words of one syllable. Even the eminent lawyer, Darrow, has made efforts in this direction. Sometimes it seems as if the cobbler makes a mistake in not sticking to his last. But this treatise on the Einstein theory, for that is what the sixth chapter may be called, is written by a true student, and it is interesting to see how differently he puts it than do the other writers who purport to explain it in simple terms. This book is so good that it is impossible to review it within the limits of our space; we strongly advise its reading. This and the book on "Antarctic Adventure and Research" fall into a science series, edited by Watson Davis. If he can keep up the pressure as they say and produce more works like these, he will certainly be doing a great service to all readers. It is very well indexed.

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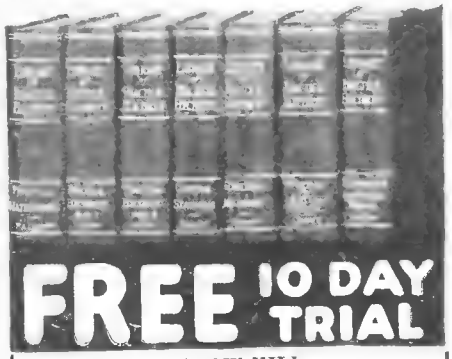

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Norman Bel Geddes—Master-Builder

by Elizabeth Scudder

(*Continued from page* 107)

a metal piece of furniture, scales, airplanes, and the interiors of our homes, as well as our places of business, should be a joy to the eye, while serving the purpose for which they are intended.

"This can be accomplished," he added, "without sacrificing either beauty or utility. In fact, by a thoroughgoing study of form and function, a unity can be realized which will be more beautiful and mechanically more perfect than any product wherein decoration and ornament are merely 'applied.' I have always maintained that an artist who cramps the utility of an object for the sake of exterior prettiness simply has failed to solve his problem.

"For illustration of my point of view I may refer to a design for an automobile which I recently completed for a well-known manufacturer. We made a study of the car with reference to aerodynamic principles, and by applying these we reduced its wind resistance twenty percent. We simplified its lines and redesigned it throughout on a sound artistic basis. The result is a vehicle vastly improved not only in appearance but also in performance. Its form is far better fitted than before to its function of self-propelled travel over a highway."

In designing furniture of metal, one should consider carefully the material with which one is working, Mr. Geddes believes.

"Why," he asks in this connection, "should the artist try to disguise the metal as wood? That formerly beds have been made of wood is no argument at all. Metal furniture should be designed in a manner which will take account of the qualities of the material, and beauty of form should be gotten by realizing the potentialities of these qualities to the fullest degree—always with regard, of course, to the function which the product is to perform.

"In my designs for the Simmons company I tried to ignore all I knew of wooden furniture, and concentrated on the material with which I was to work, and the purpose the completed object was to serve . . . I believe that success in working with all modern materials depends on the artist doing exactly the same thing. We are finding that to be true in architecture also."

The marvelous setting designed by Mr. Geddes for The Miracle.

Mr. Geddes' first commercial designs were directed to the beautification of display windows in a Fifth Avenue store. Walking down the avenue one evening he pondered the reason why shop windows seemed so uniformly lacking in appeal. Apart from

In designing metal furniture, Mr. Geddes has adapted his technique to the new material.

the merchandise which they displayed, they offered no attraction whatever.

"It came to me," he says, "that if these windows were treated as a stage and the merchandise as players, a unified object of art might be produced. Instead of a window with an unchanging and therefore insignificant background, one might make one in which merchandise and setting formed a harmonious design as in a properly staged play. To a business man such an idea might appeal as a means of increasing sales, but to me it appealed because it meant the creation of beauty and harmony where previously there had been discord. The first department store head to whom I presented my plan considered the idea for a time and then rejected it. He was too timid to carry out what appeared to him a radical innovation. The second store, Franklin Simon & Company, put the plan into effect.

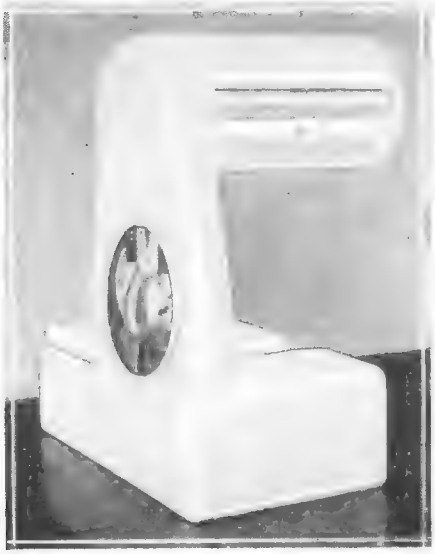
"Months later I had the satisfaction of seeing the windows of the first store decorated according to the plan I had suggested."

It was little wonder that the first department store head followed the Franklin Simon lead, for the now famous display arranged by Mr. Geddes for the latter company's window—featuring a single hat against a modernistic background—practically brought traffic to a halt, and the store was asked to exhibit it during three different weeks. Thus began the movement toward the type of window treatment which one finds today throughout the country.

As a Playboy

Mr. Geddes as playboy deserves more than passing notice. He is famous for the games he has invented, which are remarkable not only for their size but their complexity. One is a horse-racing game, on which a number of electrically operated miniature mounts compete over a course of considerable extent. So ingenious are the mechanical arrangements of this piece that it is impossible to name in advance the horse that will win. For some reason not connected with the workability of the game the horse race has been laid aside in favor of a war game which should make an instant appeal to the mathematical mind.

The war game is played on a board representing a battle terrain, twenty feet long and four feet wide. On this board are 6,000 movable units, representing military forces and armament of all types. These must be considered in their entirety by the players, who normally total a dozen.



Scale designed by Mr. Geddes for the Toledo Scale Company.

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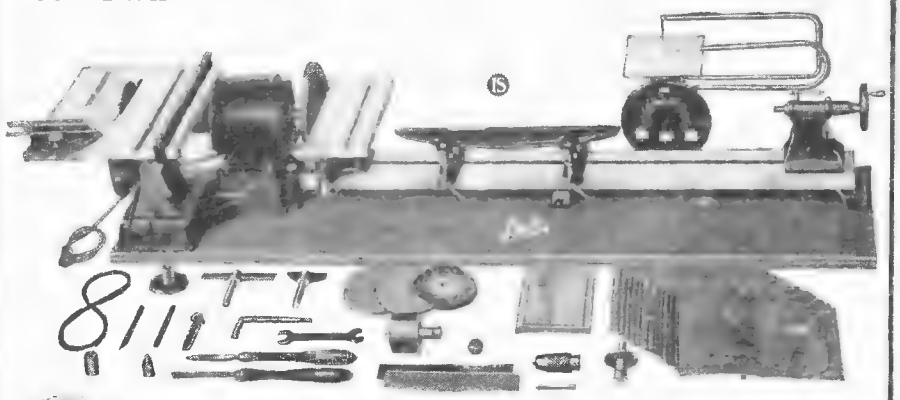

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And like the other great time savers, advertisements save money and energy, as well. The reading of them is a genuine human economy.

IN RADIO NEWS
for June, 1930

A comprehensive list of the world's short-wave stations, with their time schedules, is published in this short-wave issue—first by wavelengths, then alphabetically by call letters.

Hiram Percy Maxim, President of the American Radio Relay League, describes the pioneer work of amateurs and their status under existing radio laws.

A research opportunity for the radio amateur in the field of weather observations and their relations to the forecasting of radio reception conditions is interestingly told by Lieutenant William H. Wenstrom.

Edward W. Wilby, Associate Editor of RADIO NEWS, outlines the construction and operation of the Cornet short-wave receiver.

Samuel Egert, of S.-W. Four fame, describes the construction of an 80-meter transmitter and receiver suitable for small boats and other portable use.

In this month's Loftin-White article is described the application of the push-pull and parallel output system to the Loftin-White system of direct-coupled audio-frequency amplification. A standard direct-coupled amplifier, employing a 50-watt output tube, is described.

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Answers and Prize Awards in March Puzzle Contest

By Sam Loyd

Twenty-five Dollars in Prizes

A FIRST PRIZE of $10 will be awarded to the person sending correct answers to the two puzzles *accompanied by the best expressed analysis of the Money Problem.*

A SECOND PRIZE of $5 will be awarded for the next best analysis and correct answers to the two puzzles.

TEN PRIZES of $1 each will be awarded to the ten persons who send the next best analysis of the Money Problem, together with correct answers to the two puzzles.

Answers must be received not later than noon, June 14, addressed to "Puzzle Editor," SCIENCE AND INVENTION, 381 Fourth Avenue, New York City.

All contestants must abide by the decisions of Sam Loyd, who will examine all papers and award the prizes.

Papers of identical merit, tying for any one of the prizes, will each receive the full amount of the prize tied for.

Prize Winners in March Puzzle Contest

First Prize, of $10, is awarded to:

Robert J. Dobbs, Route No. 4, Fort Payne, Ala.

Second Prize, of $5, is awarded to:

Ralph E. Grisso, 1647 Pratt Blvd., Chicago, Ill.

The ten prizes, of $1 each, are awarded to the following:

J. Gordon Wilson, 8616 Kentucky Ave., Detroit, Mich.
Oswald L. Markle, 233 West Chestnut St., Hanover, Pa.
Sanford E. DeBerry, 4225 Walnut St., McKeesport, Pa.
B. D. Smith, 1427 Calhoun St., New Orleans, La.
F. Samuel Harris, R. D. No. 3, Ashtabula, Ohio
J. C. Grandow, 5338 So. Carpenter St., Chicago, Ill.
J. Percy, 934 Frost Court, Peekskill, N. Y.
Lionel Lemieux, 3 Notre Dame St., Levis, P. Q., Canada
Lyman R. Fink, 129 S. E. Blvd., Corona, Calif.
George W. Haaff, 2184 N. Riley Ave., Indianapolis, Ind.

Solution to the Used Car Problem

$1235 was 95 per cent of the amount the dealer received for the two old cars, or $1300.

Calling the allowance price of the better car X, then the allowance price of the cheaper car would be represented by $1235 minus X.

Then we set down the following equation; based on the information that upon one car he gained 10 per cent and that upon the other he lost 10 per cent:

One-tenth of X, minus one-tenth of ($1235 minus X) equals $65.

The value of X, the higher priced car, proves to be $942.50, and the cheaper car must have been traded in for $292.50. The better car he sold for $1036.75, and for the cheaper car he received $263.25, a total of $1300, of which 5 per cent, or $65, was profit.

Solution to a Puzzling Race

The number of times the cars met would equal the total number of laps covered by the two. Since the winner completed eight laps, the loser must have gone less than six, for it was told they had met 13 times.

If we assume that the picture showed the cars at their first meeting, then the ratio of their speeds would be as 3 is to 5. The race, worked out on that basis, shows that the cars would meet only 12 times.

Testing the picture as presenting the cars at their second meeting, we find that the faster might have gone 13 furlongs to the other's 3; or 11 to the other's 5. Neither of these ratios will check with 13 meetings.

Assuming that it was their third meeting, we find that the faster car might have gone 21 furlongs to the other's 3; 19 to the other's 5, or 13 to the other's 11. None of these will produce 13 meetings.

To assume that the pictured meeting was the fourth, is our final trial, for it was told that the race was less than one-third complete, and that bars out the possibility of a fifth meeting being the one in the picture.

Taking it as the fourth meeting, the faster car might have gone 29 furlongs to the other's 3; 27 to the other's 5; 21 to the other's 11, or 19 to the other's 13.

Testing these various ratios, reveals that the assumption of the faster car having gone 19 furlongs to the other's 13, is the only one that produces 13 meetings for the 8-mile race, and checks with other conditions.

At the conclusion of the race, the slower car had gone 13/19 of 64 furlongs, or 43 and 15/19 furlongs. So the winner won by a distance of 2 miles, 4 and 4/19 furlongs.

The white car, which in the picture was 3 furlongs away from the starting flag, is identified as the faster car, it having gone two complete laps and 3 furlongs up to the time of its fourth meeting.

Hook Yourself *a* Rug

Courtesy Hamburg-American Line

Captain Conrad Lueck, Commander of the S. S. Reliance, gives instructions in hooking rugs to one of his sailors, while First Officer B. Majewski looks on.

By J. E. Harder,
Hooked Rug Expert of the Hooked Rug Shop, Atlantic City, N. J.

DO you need a bright rug for your living room! A runner for the den? A soft, durable rug for the nursery? They cost quite a lot ready-made, so why not hook yourself a rug?

Hooking rugs is a favorite pastime with some merchant seamen. . . . Captain Conrad Lueck, of the Hamburg-American S. S. Reliance has been an expert in this art since his youth, and recommends the pastime to his crew as both agreeable and profitable. On a long sea voyage you may see them hooking rugs . . . and though very busy, the captain himself manages to pick up a hook now and then. An artist as well as a craftsman, he also sketches patterns for his friends to work into rugs.

The hooked rug and its peculiar method of manufacture are primarily American developments, growths from Colonial times, when our forefathers needed durable floor coverings that could be made at home by themselves and their families. Quite often they worked without a frame, or used four pieces of wood nailed together into a rectangle, upon which they tacked the burlap base. . . . A hook of shaped bone was pushed through the burlap, home spun yarns or strips of cloth hooked on, and drawn through, forming a loop. . . . This process they repeated every few strands until the burlap was filled with loops. It took weeks of painstaking effort to produce a 24×48 inch rug.

Today, the modern frame and looper enable an experienced operator to make such a rug in about eight hours; the beginner naturally requires more time. Finished rugs give many years of hard service, and when made of fast color pure wool, can very easily

Courtesy Superior Appliance and Pattern Co.

This frame allows one to work in comfort and is equipped for making rugs, tapestries and needlework.

PICK YOUR JOB

Railway Postal Clerks
City Mail Carriers
City Post Office Clerks
General Office Clerks
Customs Inspectors

NO "LAYOFFS"

These are steady positions. Strikes, poor business conditions, or politics will not affect them. Government employees get their pay for twelve full months every year.

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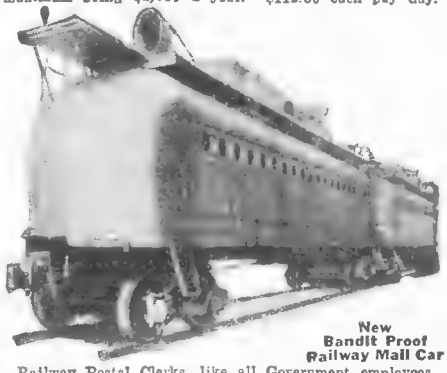
Railway Postal Clerks get $1,900 the first year, being paid on the first and fifteenth of each month. $79.17 each pay day. Their pay is quickly increased, the maximum being $2,700 a year. $112.50 each pay day.



New Bandit Proof Railway Mail Car

Railway Postal Clerks, like all Government employees, have a yearly vacation of 15 working days (about 18 days). On runs, they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation their pay continues just as though they were working. They travel on a pass when on business and see the country. When they grow old, they are retired with a pension.

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POST OFFICE CLERKS

Clerks and Carriers now commence at $1,700 a year and automatically increase $100 a year to $2,100 and $2,300. They also have 15 days' paid vacation. City residence is unnecessary.

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(Open to men and women 18 to 50)

Salary $1,260 to $2,500 a year. Pleasant clerical and filing work in the various government departments at Washington, D. C., and other cities throughout the country.

IS YOUR JOB STEADY?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, no chance in sight for PERMANENT employment; frequently out of a position and the year's average salary very low. DO YOU GET $1,900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2,100 TO $2,700 A YEAR?

YOU CAN GET THEM

Country residents and city residents stand equal chance. Experience is usually unnecessary, and political influence is not permitted. Let us show you how.

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- ☐ Post Office Clerk.....($1,700-$2,300)
- ☐ City Mail Carrier.....($1,700-$2,100)
- ☐ Rural Mail Carrier.....($2,100-$3,300)
- ☐ Government Clerk—File Clerk.....($1,260-$2,500)
- ☐ Inspector of Customs.....($2,100-up)
- ☐ Prohibition Agent.....($2,300-$2,800)

Name .....

Address .....

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"Guided only by the trail of red ants, they broke away the asphalt in the gnarled old tree. There, within the hollow, one phase of Lynn Trevor's mysterious disappearance stood gruesomely explained."—*Scene from the full book-length story in the June COMPLETE DETECTIVE NOVEL—*

"THE HOLLOW TREE MYSTERY"

By Madelon St. Dennis

This is the most thrilling, stirring, baffling case ever handled by that clever celebrated girl sleuth, Tam-O'-Shanter! Lynn Trevor, president of the Cedarcliff Bank and the town's idol, is missing. Supposedly he had gone on a vacation; but his aged father suspects foul play and engages Tam.

The night Tam arrives (she is disguised as Mr. Trevor's nurse) someone tries to poison Lynn's dog. Lynn's beautiful wife, Ivy, doesn't seem worried about his whereabouts, but something else is on her mind. In the garden Tam picks up an opal lost by Ivy the night of Lynn's departure. It becomes evident that Ivy and a young doctor, living near by, are in love.

From that point on red ants and Tam's sixth sense as a super sleuth lead through adventure and thrills to the untangling of a double love triangle and to the powerfully dramatic climax of "THE HOLLOW TREE MYSTERY"! *Try to solve it yourself!*

If you haven't as yet given yourself the treat of one of these exciting, tense, baffling COMPLETE DETECTIVE NOVELS—buy the June issue today. This one issue contains the complete full book-length thriller described above—just the kind of story thousands of people gladly buy at $2.00 per in bookstores! *And it will cost you—not $2.00—but only 25c.*

Enjoy the Complete Book-Length Story of "THE HOLLOW TREE MYSTERY" in the June—

COMPLETE DETECTIVE NOVEL MAGAZINE

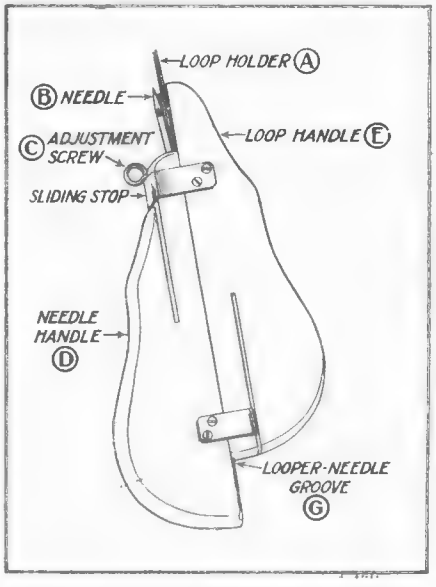
A $2 Novel for 25c—Buy It TODAY!

be kept in good condition by washing, dry-cleaning, or vacuum-cleaning. Some people still work without a frame, or use the crude type of colonial frame, laying the rectangular formation over two chairs, sewing or tacking the stenciled burlap on it, and working down on the frame. There are several frames on the market. Three or four years ago Emory J. Gearhart of Clearfield, Penna., developed a whole series of appliances enabling the home owner to make rugs easily and pleasantly. His products are being marketed under the trade name of Superior Rugcraft, and a description of his frame and looper may prove interesting as an example of modern hooked rug equipment.

The Frame

The frame is of rigid metal construction, the legs of angle iron, and the rollers of round wood. Upright legs hold the top roller, grooved to admit the burlap. The brace legs (for the lower roller and burlap) have four adjustment holes so the pattern may be adjusted to different angles, two in easel position for looper work, and two in flat position for punch needle or hook. Flat braces extending above the top roller hold a round rod upon which are placed the yarn spools. The sides of the pattern are secured by metal fabric clamps, which grip the burlap, all these are attached to the roller braces.

A gear wheel on each wooden roller enables you to change the pattern's position without removing it from the frame, and the ratchets on the right legs hold the burlap taut. As a portion of the rug is completed, you disengage the upper ratchet, roll the finished section around the lower roller, adjust the ratchet and roller and proceed again with your work.



The Looper

Some operators still use hooks which necessitate holding the loops to guide them for hooking rugs. A rigid needle and a flexible loop-holder are really necessary for any looper or needle or hooker. For the Superior looper shown above, two wooden handles are slotted, held together with brass straps. One has a rigid steel loop-holder and a flat brass spring to control the needle in the opposite handle. A brass screw-eye in the narrow end of the needle-handle serves as a guide for the yarn, and in addition, governs the length of the handle stroke, prevents the two handles from coming apart, and adjusts the width of the loop to accommodate different weight yarns and rags. A minimum of hand work is achieved.

What About Your Arithmetic?

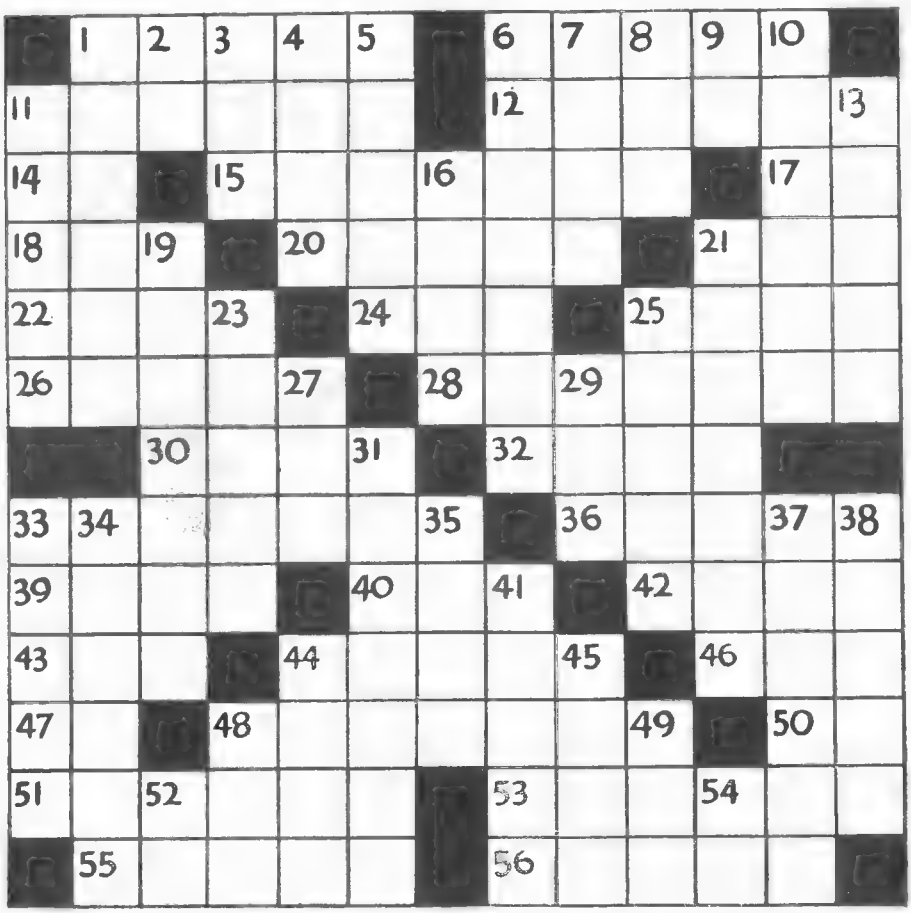
A Cross-word Puzzle by RICHARD H. TINGLEY, C.E.

ACROSS

318 more than X.
3. Subtract DCCCLXXVII from the square feet in an acre.
11. Add 4624 to one and a half times the number of minutes in a leap year.
12. Nine times 43907.
14. The number of signs of the zodiac.
15. Multiply together the following digits and decimals of a digit, 9, 8, 9, 8, 9, 8, 9, 1.2398, then add 87 to the sum (nearest whole number).
17. The last of the "teens."
18. The square of 26.
20. Subtract 1237 from the cube of 39.
21. Eighty years before the Norman Conquest
22. Four years before the deacon "finished his one hoss shay."
24. Symbol denoting the act of castling on the queen's side in chess.
25. The date of the Battle of Quebec where Wolfe defeated Montcalm, and both generals were killed.
26. A one-ninth part of 545994.
28. 14606 23/32nds cords expressed in square feet.
30. 450.42 pounds expressed in Troy ounces. Nearest whole number.
32. Nine years before the Puritans landed.

DOWN

1. 658 more than 112 times the third note of the musical scale.
2. Symbol denoting the act of castling on the king's side in chess.
3. Pi, carried to two decimals. Decimal point after first figure.
4. The year of the Battle of Waterloo.
5. Multiply the year in which Charlemagne was crowned King of the Franks by 105.85.
6. Multiply the nearest whole number obtained by squaring 44.72 by 2194.0405.
7. 1012 years from now.
8. Ten more acres than there are in a square mile.
9. Six more than six bits.
10. Subtract 1024 from the product of the digits 2, 3, 4, 5, 6, 7, 8, 9.
11. Four more than 2267 yards expressed in inches.
13. 1470 cubic yards expressed in cubic feet.
16. The number of the Arabian Nights.
19. Multiply the square of 500 by 26.262.
21. 238662 short of ten million.
23. Multiply these digits together, 8, 6, 4, 3, 2, 7, 2 and then add 336.
25. Add .1 to eleven years ago.
27. The seat of the Capital of the United States.
29. 39 years after the Hegira.



33. One more than a hundred acres expressed in square feet.
36. Multiply the present year of grace by 10.014. Nearest whole number.
39. 28 years before George Washington was born.
40. One less than M.
42. The number of years between the sack of Rome by Alaric and the crowning of Napoleon Emperor of the French.
43. The year in which the Greeks under Themistocles defeated the Persians under Xerxes at the Battle of Salamis.
44. Add 231 to the pounds in 25 long tons.
46. Twenty-eight thirty-seconds. Decimal in front.
47. The number of Ali Baba's "thieves."
48. Add the number of feet in 34.2108 miles to a million and a half.
50. Two perches.
51. Multiply MMDCCCXXXVIII by 298.6582. Nearest whole number.
53. Add .225 to DLXXXII.
55. Subtract .00720 from 1/32nd. Decimal in front.
56. Add 800 to the number of hours in a year (not leap year) and add the sum to L.
31. 173575 less than the number of minutes in ten leap years.
33. 62.8 times the number of feet in a furlong.
34. 18902 times the number of quires in a ream.
35. The year the 18th Amendment became operative.
37. 464.5625 times the number of acres in one square mile.
38. Seventy-four thousand five hundred and thirty-five.
41. 6345 short of C.
44. The year of the Jewish calendar that began in September, 1929.
45. Four hundred years before the fall of the Bastile.
48. The number of years since the Declaration of Independence.
9. Five times LXV.
52. Eight times the number of lives a cat is said to have.
54. The number of miles in the original Marathon. Nearest whole number.

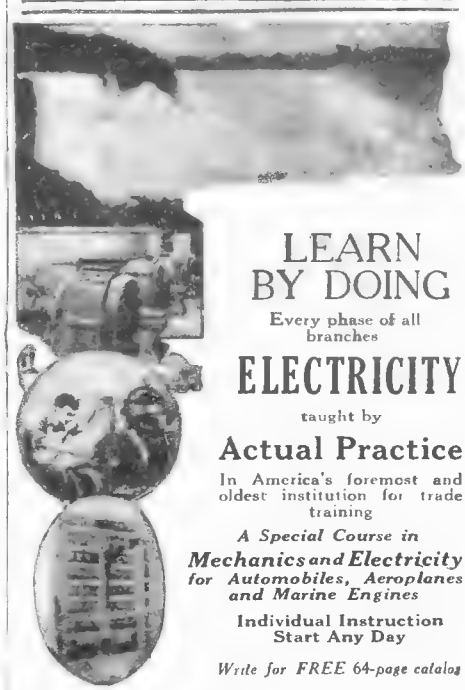
See Solution on page 184

WHEN THIS BOAT COMES PUT-PUT PUTTING HOME . . .

THERE'LL be a warm frying pan ready. For it's a sure bet there'll be fish to fry when you go in a motor-driven "Old Town." You motor in an "Old Town" to your favorite spot . . . you're there in time for the fishes' breakfast . . . and *they're* back in time for *yours!*

"Old Towns" are wonderfully fleet and sturdy craft. Durable—built for heavy loads, but easy to handle. With sponsons if you like. Free catalog shows and prices many models — rowboats, dinghies, all canoe types; big, fast, seaworthy, all-wood, outboard boats for family use, and speedy step-planes. Write today. Old Town Canoe Co., 1146 Main St., Old Town, Maine.

"Old Town Boats"



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Popular Homecraft is published every two months. The next issue will be the July number, out the first of June. The price per copy is 35c on the newsstands. Pin dollar bill to coupon from this announcement and we'll send the next 3 issues postpaid to your door. Clip coupon—Mail it Now.

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Name ...

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Tom, Dick and Harry, Psychologists

By Edward J. Beck

(*Continued from page 129*)

are that you didn't—judging from what a candy manufacturer disclosed of his discoveries in the field of color. Chocolates sell best, he said, when done up in red. Green out on the street may mean "go," but at the candy counter it seems to mean "stay."

Desserts and Lemonade

THIS observation checks well with what the dessert manufacturer said he had learned. His product was originally uncolored and sales were slack. But when he added rose-color, his sales increased six-fold, though the dessert remained identical in flavor and content.

The canny boys who run refreshment stands in connection with carnivals and circuses, of course, knew this secret long ago. They accidentally discovered that they could increase the flood of nickels across their dripping oil-cloth bars by adding pink coloring-matter to the lemonade they concoct.

The cafeteria manager, represented in the notebook, would probably give a fellow a blank stare if you quizzed him: "Did you ever go into the psychology of color?"

Yet the cafeteria man is no dub in this subject. "People grab the red desserts and salads in preference to dishes with the milder colors," he too observed. "We sell ten dishes of red gelatine to one of lemon or orange. A slice of tomato or beet, in other words a touch of red, on a plate of salad, makes 'em stretch out their hands for it."

Rubber Goods and Fruit

EVEN the rubber goods merchant testifies that the reds have it. "It's silly," he said, "but customers have a notion that red rubber is better than white or gray, though, of course, it is not. They think red tubing is more durable."

Commercial apple-growers have found that an insipid apple that happens to be bright red usually will outsell a juicy yellow or greenish one. So these business men naturally go in for varieties that are not better but redder than the old-time fruit.

Bibles and Babies

THESE fixed color ideas, according to a book-store manager, even extend to the sale of Bibles. To sell, Bibles must be bound in *black*. A publisher once tried the experiment of distributing cloth-bound Bibles in red and blue covers and the bookseller ordered some. Nobody would buy them, he regretted.

Baby blue gets the call in another connection. "Blue-eyed babies are more in demand for adoption than brown-eyed ones," remarked the secretary of a Children's Aid Society.

Color plays such a big rôle in our everyday lives that I am inclined to take some stock in a novel conception put forward by an oculist. He suggested that the well-known "change of climate" helps many patients not because they thrive better in a different air but because the trip gives them a change of color.

"Chromatic Vitamins"

"TOO much of the drab, dirty gray of the city, too big doses of it," he hazarded, "is probably harmful to the mental and physical health of sensitive persons.

"High-keyed natures demand a certain amount of color just as the body needs phosporous and iodine.

"Vacations are helpful because they offer a change of color-environment, which is both restful and stimulating. Possibly the time will come when we shall get 'chromatic vitamins.' Rooms will be instantly transformed from one shade to another by the turning of a switch."

The Magic of Numbers

ANOTHER groove that seems to have been worn deep in all our minds is our preference for numbers—the same pet numbers—three and seven, five and ten. A curator at our art museum was forcibly reminded of this fact last winter when times were hard and many persons felt disposed to sell certain heirlooms and antiques.

He got so he could estimate the age of any antique that showed up even before the inquirer or would-be seller could unwrap his parcel.

"Any heirloom that has been in a family any length of time at all," he said, "is always three hundred years old. Never one-hundred-fifty or two hundred years. Ninety out of every hundred callers I've had this winter claimed that inevitable three-century history. Or if generations were mentioned it was always: 'This whatnot has been treasured by our family for seven generations.'

"Heirlooms"

"WHY always three hundred years or seven generations? I've speculated about that a lot. Most of the stuff wasn't even a hundred years old. The owners were perfectly sincere. They were merely subject to the same delusion.

"One explanation, I believe, is that the heirlooms had been owned by the grandfather, or in other words, three generations. It's easy for the mind to jump from three generations to three centuries.

"A rational consideration may enter in also. This country has only been settled about three centuries, which would set outside limits to plausible claims. The biggest self-deception possible was 'old as the Mayflower.' But it's uncanny how universal the three-hundred hokum is."

The old German razor grinder, worth meeting because he made a real art out of his job, ran up against another pet number.

"Be careful when you grind this razor," the patrons would admonish him. "It's a hundred years old. My great-grandfather brought it over from Sheffield."

"Every old razor, for some reason, is just one hundred years old," snorted the old German. "Bunk! A razor that old would have been honed and stropped down to nothing long ago."

The Law

ONE such numerical addiction entails more serious results. Watch your paper and notice the length of prison sentences handed out to law-breakers. You'll be having an unusual experience if, in a month's check-up, you can find a single eight-year sentence. The usual terms, you'll discover, are one, two, three, five, seven and ten.

It's too bad but the men on the bench cannot escape their bondage to the same mental habits that govern the rest of us.

If punishment were based on the gravity of crimes, it is scientific to assume that the sentences would be more equally distributed. Yet four, eight and nine-year sentences are very rare. Judges, like the rest of us, have their pet numbers.

Meet Your New Planet

By Joseph H. Kraus

(*Continued from page* 111)

family. Its period of rotation is in the neighborhood of from 275 to 600 years. Since the planet is about 45 times as far from the sun as the earth, it receives 2,000 times less heat from the sun than the earth receives. Accordingly, its temperature on the sunlit side would be about 350° below zero Fahrenheit. Any atmosphere on this planet would be exceedingly dense. Because of this low temperature, gases such as nitrogen would be frozen.

The discovery of the new planet is hailed as the greatest astronomical discovery since the planet Neptune was located in 1846. All of the planets, with the exception of three, have been known to ancients more than 3,000 years ago. In 1781 Sir William Herschel discovered Uranus.

The eccentric action of Uranus caused two men, U. J. J. Leverrier, of France, and John C. Adams, an Englishman, working simultaneously but independently of each other, to predict the position of a planet now known as Neptune. They both pointed their telescopes to the predicted position. Leverrier's discovery was the first to be given to the world.

Professor William H. Pickering has advanced the theory that there may be two or three small planets instead of one large one still awaiting discovery. Latest advices indicate that the new planet is slightly smaller than the earth.

The Sky Talkers

By William W. Chaplin

(*Continued from page* 113)

tangible evidence that news of scientific developments was becoming daily more popular, of which I was glad, for it had long been my belief that there was no news more interesting or significant. But the fact that so many reporters had been assigned to the story also meant that each one stood so much less chance of being first, and being first is a reporter's chief aim in life.

On the way out to Hadley Field, near New Brunswick, N. J., in a bus, we drew lots to see who should go up first. The equipment was at that time set up in a Fairchild cabin plane with room for but two passengers besides the pilot and an engineer. I drew a slip of paper from the hat and slowly unfolded it. It bore the number two; one other man was apparently ahead of me. But then it developed that more slips had been prepared than there were reporters and number one had not been drawn. On such slim threads of chance do reputations often hang.

At the field all was in readiness and within five minutes we were in the plane, Captain Ray Brooks at the controls and F. S. Bernhard, a Western Electric engineer, at the short wave radio set. A thousand feet up we burst through the drizzle into warm sunlight. Bernhard was in communication with the experimental radio station at Whippany, N. J., and he cut me in.

"Get me Vanderbilt 5100 in New York," I asked, and the call was put through on the regular telephone lines and hooked up with the radio circuit to the plane. The operator in the A. P. office plugged in at the light on her switchboard and connected me with the city desk. For five minutes I chatted with a rewrite man, describing our flight and the equipment, hearing him distinctly despite the roar of our Pratt-and-Whitney Wasp just outside the cabin windows. He told me later that my voice was as clear as in an ordinary ground connection, and said he had been surprised not to hear the engine, a circumstance which was due to the fact that the transmitter on the plane set has a trigger to disconnect it while the other person is talking. When the man in the plane talks, he presses his mouth close into a soft rubber ring that excludes outside noises, and he wears a regular headset for listening.

This First Demonstration

This first demonstration was just a sort of stunt for publicity purposes, to let the world know that such conversations were possible and to inform air transport lines that whenever they wished they could have their planes so equipped. But later I made practical use of the flying telephone booth in covering a story.

That was when the Graf Zeppelin came to America for the third time to start its historic flight around the world. Plans were made to meet the great dirigible as it approached Lakehurst, report its arrival from the air, and have that report and description broadcast on the national radio network of the Columbia chain at the same time it was being telephoned to my office.

All would have gone smoothly but for two things. In the first place radio messages from the Graf were few and far between, and it was very uncertain just when she would arrive. Another was that a wind was blowing that made flying anything but a joyride. But work is work and we took the air for the first time about eight o'clock in the morning. And then the air took us. I have flown through quite a bit of weather here and there but I got some bumps that day that I can still feel in my stomach when I think of them. But Ray Brooks sent his sturdy crate spiraling upward to about five thousand feet where the air was much smoother, as well as much colder.

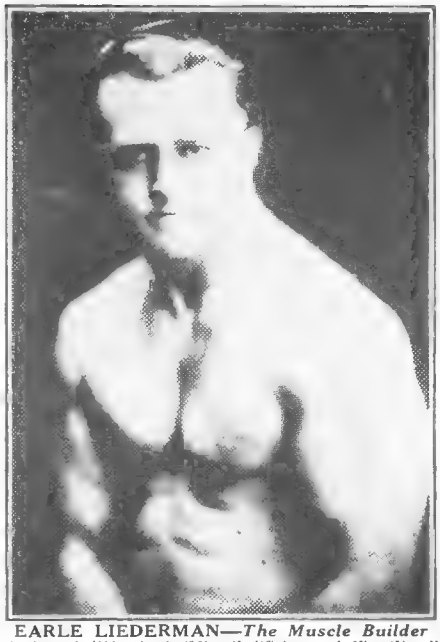
And then we started spending the day. We kept in constant touch with the ground, Bernhard talking to Whippany, Norman Brokenshire of the Columbia system with his office, and I with mine. We went down for lunch and then back to the sky, staying most of the afternoon high over the Lakehurst hangar, where I could inspect a view I had previously seen from the Navy dirigible Los Angeles and the Army blimp TC-5.

Zeppelin Is Sighted

Shortly before dusk, with no recent report from the Graf, we began to run low on gas, so we hopped back to Hadley and no sooner had we landed than we were informed that the German Zeppelin had been sighted off the Jersey coast. Ray Brooks cracked his throttle and we rode a tail wind back across Lakehurst and to the shore in considerably better time than the Fairchild people promise for ships of that type.

Picking the Graf up just as she crossed the American coast line, I called my office and dictated a story of the ship's arrival, and my words were broadcast on the Columbia system even as the rewrite man typed them as they came over his phone. After that, Brokenshire spoke to the radio

(*Continued on page* 183)



EARLE LIEDERMAN—*The Muscle Builder*
Author of "Muscle Building," "Science of Wrestling," "Secrets of Strength," "Here's Health," "Endurance," etc.

Kill This Man

There's a devil inside of you. He's trying to kill you. Look out for him! He tells you not to work so hard. What's the use—the boss only piles more work on you. He tells you not to bother with your body. Do you recognize him? Of course you do. He's in us all. He's a murderer of ambition. He's a liar and a fool. *Kill him!* If you don't, he will kill you.

Saved!

Thank your lucky stars you have another man inside of you. He's the human dynamo. He fills you full of pep and ambition. He keeps you alive—on fire. He urges you on in your daily tasks. He makes you strive for bigger and better things to do. He makes you crave for life and strength. He teaches you that the weak fall by the wayside, but the strong succeed. He shows you that exercise builds live tissue—live tissue is muscle—muscle means strength—strength is power. Power brings success! That's what you want, and gosh darn your old hide, you're going to get it.

Which Man Will It Be?

It's up to you—Set your own future. You want to be the Human Dynamo? Fine! Well, let's get busy. That's where I come in. That's my job. Here's what I'll do for you.

In just 30 days I'll increase your arm one full inch with real live, animated muscle. Yes, and I'll add two inches to your chest in the same time. Pretty good, eh? That's nothing. Now come the works. I'll build up your shoulders. I'll deepen your chest. I'll strengthen your whole body. I'll give you arms and legs like pillars. I'll literally pack muscle up and down your back. Meanwhile I'll work on those inner muscles surrounding your vital organs. You'll feel the thrill of life shooting up your old backbone and throughout your entire system. You'll feel so full of life you will shout to the world, "I'm a man and I can prove it."

Sounds good, what? But listen! That isn't all. I'm not just promising these things. I guarantee them! It's a sure bet. Oh boy! Let's ride.

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What do you think of that? I don't ask one cent. And it's the peppiest piece of reading you ever laid eyes on. I swear you'll never blink an eyelash till you've turned the last cover. And there's 48 full page photos of myself and some of my prize-winning pupils. This is the finest gallery of strong men ever assembled. And every last one of them is shouting my praises. Look them over. If you don't get a kick out of this book, you had better roll over—you're dead. Come on then. Take out the old pen or pencil and sign your name and address to the coupon. If you haven't a stamp, a postal will do. But snap into it. Do it now. Tomorrow you may forget. Remember, it's something for nothing and no string attached—no obligation. GRAB IT!

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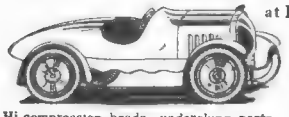

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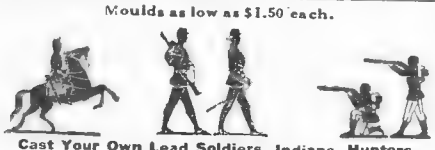

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Light—Is It Waves or "Bullets"?

By Donald H. Menzel, Ph. D.

(*Continued from page* 136)

either side much as though the obstacle were non-existent. (See Fig. 2) Hence Newton concluded, logically as far as the above experiments were concerned, that light could not be waviform. If only he had tried out tiny waves, however, his objections would have vanished, for these do cast shadows; the smaller the waves the more distinct the line of demarcation.

L.—What then, is the basis of preferring one theory above the other?

P.—The crucial test was made for the first time about 1800 by Thomas Young. I think I can show you what to expect by an analogy. Imagine two canals that empty into one another like this. Now let us suppose that the water in them is flowing in waves. If the crests of the waves in the tributaries are parallel, you see that the waves will reinforce each other at the entrance and extend into the main canal. On the other hand, if the crest of the wave of one tributary flows into the channel at the same time as a trough enters from the other, that the excess of the former will just neutralize the deficiency of the latter and the surface of the primary canal will be unruffled.

Waves on a Card

Analogously, if the *crests* of two beams of light converge we shall still have a *vibration* present. If, however, the *crest* of one coincides with the *trough* of the second, the result is, of course, no vibration, i.e., *no light*, and we obtain the curious result that

light + light=darkness

On the basis of the corpuscular theory, such a result cannot be explained.

Young's experient is easy to perform. Pull down those window shades, and we'll try it now. I'll stick a pin through one of them to admit a tiny beam of sunlight. Now punch two pinholes, very close together, in this visiting card, (about half a millimeter apart), and hold it in the beam of sunlight a couple of yards from the window. See! The twin rays from the pair of holes overlap and merge into one another like the tributary canals of the analogy. Now look at this other card I'm holding where the beams overlap, a couple of feet from the first card. Right at the center can you see those fine streaks alternately bright and dark?

L.—Yes, I see them plainly. They are perpendicular to the line joining your pair of pinholes.

P.—At the center, which is equidistant from the two holes, the two beams of light waves are vibrating "in phase," which means that the crests coincide, and we have a bright streak. The point a fraction of an inch away is just enough nearer one of the holes to throw the waves out of step, and darkness results. Go another fraction of an inch, and the vibrations reinforce one another again.

L.—How are you certain that the streaks are not a curious shadow effect?

P.—Cover each hole in turn and you observe that the streaks disappear. They are plainly due to the interaction of the twin beams. Darkness occurs where the two beams *interfere* with one another. The phenomenon, therefore, is known technically as *interference*. It is the most convincing evidence that light is waviform and that there is, consequently, an ether.

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IN AERO NEWS AND MECHANICS

for June-July

Several choice glider articles covering every phase of this popular art are to be found in the forthcoming June-July issue.

Capt. Robert A. Smith, Manager of Fairchild Aerial Surveys, Inc., tells most interestingly of the troubles that beset the pioneer aerial photographers, taking us through the war days right up to the present.

A most comprehensive story about the possibilities of steam power for aircraft has been prepared by Alfred M. Caddell, who has investigated the field for this little known power plant.

"Vacations in the Air" carries its own appeal, and inasmuch as this was written by Capt. Frank M. Hawks, holder of both the west to east and east to west trans-continental air records, it may be depended upon that this story is good.

Capt. Lewis A. Yancey, of trans-Atlantic flight fame, has gone thoroughly into the elements of flying meteorology, and when we have an expert to diagnose weather, the chances are that the reader will learn something about it.

"Flying the Timber Trail," by James Nevin Miller, is a most interesting account of the forest fire air patrol.

And "Dawn Patrol" -a true story of the Royal Flying Corps in the war, simply takes the reader's breath away.

"The Aircraft Diesel Makes Its Bow"—the story of the development of the Packard Diesel, by Capt. L. M. Woolson.

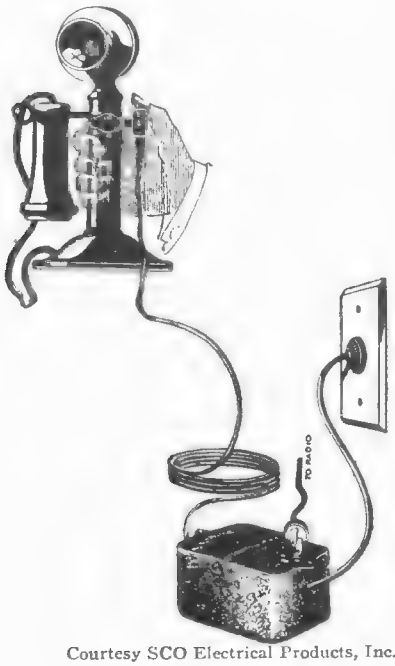
"Air Ferries, Ltd."—the shortest airway in the world is also one of aviation's progressive stories.

Radio Remote Control

A REMOTE control device now available gives to its users the great convenience of being able to turn their radio set off and on directly from the telephone or other remote point.

It saves walking across the room or into the adjoining room to shut off the radio before phoning and making another trip to turn it on after phoning. The control unit at the radio is a nicely enameled box 3¼ inches long, 2½ inches wide. 2¼ inches high, having a bakelite top with an outlet for connecting the radio cord. This unit contains an AC operated control relay and a step-down transformer that reduces the voltage to ten volts in the fine wire running to telephone switch. The AC operated relay controls the current to radio.

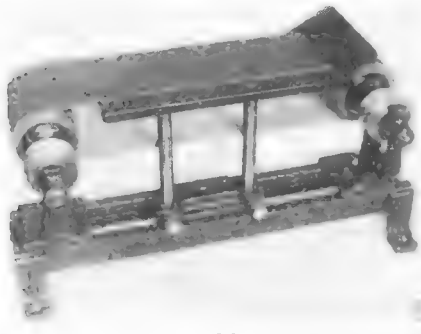
The switch just snaps on to phone standard. Does not need a service man to install as there are no connections to make.



Courtesy SCO Electrical Products, Inc.

High-speed Belt Sander

A NEW and unusual belt sander which attains a speed of 3,500 r.p.m. has recently been placed on the market by a prominent manufacturer of lathe tools. On account of the novel pulley drive, a quarter horse-power motor will furnish the necessary power for the sander. It is unexcelled for quickly putting a straight grain finish, on metal, wood, bakelite, etc. The flat metal bed under the belt preserves straight lines and sharp edges. The belt is adjusted by raising or lowering the bed. An unusual feature of this sander is that it can be used either in an upright or horizontal position. It is superior to a grinding wheel for sharpening chisels, jointer blades, and other keen edged tools as it grinds the entire surface all the time and does not overheat the work.



Walker Turner Co., Inc.

Non-slip Screw-Driver

HERE is a new screw-driver, around whose bit is placed a protective cowl to prevent it from slipping. The bit is made of fine chromium steel, and tested for torsion strength before leaving the factory. This insures a bending of the bit rather than a breaking when used in tight corners. It is especially adapted for crowded space, and does not need to be adjusted for any different type of screw. The screw-driver comes in many different types, each designed for some particular kind of work. For instance, the ignition screw-driver which is designed for repairing the ignition system of autos, etc., is equipped with a tube and collar of bakelite-fibre to provide the needed insulation.

Courtesy Abco Manufacturing Sales Co.

When Fate Fooled the Great Leon

By Dunninger

(*Continued from page* 141)

theatres where Leon was appearing. One night the lady didn't make her getaway quickly enough from beneath the shroud-like robe and the flames shot up and severely burned her. One or two other assistants received second and third degree burns when attempting this startling effect. But Leon has now perfected this illusion so that but little danger of injury to the assistants is possible.

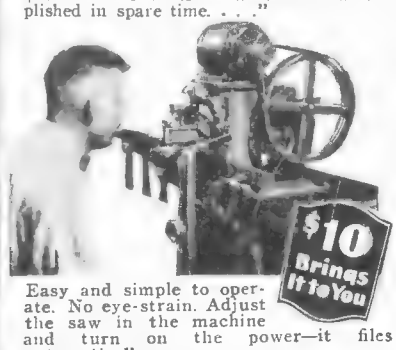
An experience my friend La Vellma had some years ago is interesting. In each town La Vellma hired a "plant" fellow, who, for so much per show, would come up on the stage when invited by the entertainer and act natural, thereby getting more out of this natural type of clowning than if he attempted to be funny. The town in question was one of those places where everybody knows the town loafer. This was the fellow La Vellma picked. Instructing him what to do he gave the fellow a dollar and told him to hand that to him when he asked him for a loan of a bill during the performance.

The curtain rose on the magician's act and during the course of events everything was going along smoothly and the crowd out front was very appreciative; the fellow was invited to step upon the stage and assist in the following experiment. Up stepped the town clown and upon being recognized by the spectators was given a big hand. Awkwardly bowing his thanks the fellow was asked by La Vellma for the loan of a dollar. This got another big laugh from the spectators. Fishing down in his pocket the clown handed the performer thirty-five cents. "But I asked for the loan of a dollar," said the master of legerdemain. Then in a more serious voice, "What did you do with the dollar bill I gave you this morning?"

Again a laugh from the amused audience, but the biggest laugh of all was yet to come when the loon replied, "That's all I have left of it. I was hungry and I bought some dinner!"

Cash In Your Spare Time

If you want to add from $10 to $35 a week to your present earnings, here is your chance. Many men are making good money filing saws on the Foley Automatic Saw Filer. Everett Myers, shown below writes, ". . . I banked $161.66 in one month which was accomplished in spare time. . . ."



Easy and simple to operate. No eye-strain. Adjust the saw in the machine and turn on the power—it files automatically.

The Foley Model F-5 "3-Way" Automatic Saw Filer

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Build A Permanent Business

Many men who started in spare time are now making big profits filing saws on their Foley machines, in their own cash business. 94c out of every dollar is profit! Paul Davidson, who does spare-time work, writes, ". . . Have made as high as $12 in one day . . . business increasing all the time . . . will soon be forced to put in full time. . . ."

FREE PLAN will help you get started. Get in on these easy profits. Don't delay—write for it NOW!

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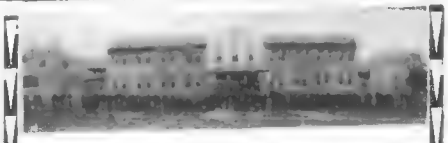

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are given explaining exactly how bartenders of old concocted practically every drink known to mankind. Many forgotten gems of purest translucent color are here restored to the human race. Perhaps they may yet spread their sunshine on these dark days when the mixing of a good drink is almost a lost art. *And what drinks they are!!* Here are just a few:

Kiddie Kar Kocktail	Hello, Montreal
Manhattan	Harvard Cocktail
Tom Collins	Careless Love
Golden Fizz	Widow's Kiss
Bacardi Rickey	Horse's Neck

The "HOME BARTENDER'S GUIDE" also contains dozens of famous old songs that you will want to get right up and sing loud and long—especially loud and long if you have tried a few of the recipes. Here you will find "Father, Dear Father, Come Home with Me Now," the original "Frankie and Johnnie" song, and many others.

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The Authors

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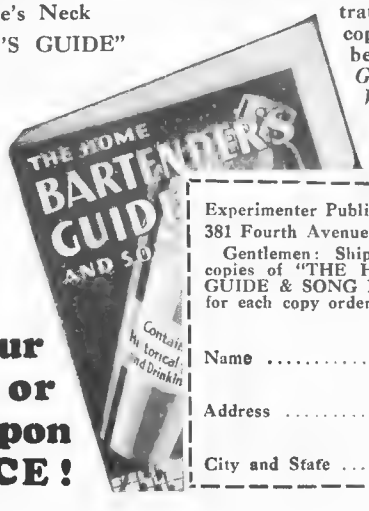

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FORECAST

By the Official Forecaster

HOW would you like to see S & I step up the volume of its **Spotlight of Science** about a hundred percent? . . . Well, that's what we have in mind for the months to come. We find that though we pick and choose with the utmost care in the world, nevertheless, we have had to leave out things as significant as many that we've put in. The one course seems to be to increase the volume of pictures and text. We're going to try hard to maintain the voltage, too.

THREE fine features, we believe, are in process—an informative article on **Millionths of Inches** in quantity production; a story about the alphabet, the **"Simple A-B-C"** in which our language is written; an **Exposé** (in the good-natured sense) of the devices used in making an extraordinary motion picture . . . We don't think any of these will keep you awake nights with its hair-raising climaxes, but we feel pretty sure that you'll be glad to read them.

THE growing army of motorless flyers will be served shortly with a series of constructor articles on a **Secondary Type Gliding Ship**—designed by two men wise in the science of bird-like flying as practiced here and abroad. We hope to make plans for this glider available almost as soon as the first article is published, and gliding clubs will find in them a most feasible means of securing a Secondary Glider of assured efficiency at low cost . . . A **Survey of the Gliding Scene** by a master observer is also on the boards, with some instructive notes on the art of gliding.

AMONG the **How-to-Make-It** items we have in process are such various subjects as a **Stroboscope**, a **Fuse Rack and Test Lamp**, **Musical Glasses**, a **Scroll Saw**, and a **Garden Swing . . . Chemistry** will be taken care of with articles both interesting and appropriate—one on **Making Your Own Fireworks** is slated for the July number of S & I. We can't promise to keep as close to the spirit of the nearest holiday all the year 'round, of course, but we'll try not to overlook any seasonal connection . . . By the way, did you note that for May we transferred the scene of our experiments to the **Garden**?

ARE you a **Piknik** or an **Asthenic**? . . . Seriously, these are the terms being applied by medical men to two seemingly distinctive types of human beings. The names are indicative not only of characteristic bodily structures, but also of temperaments which appear to correspond. This new venture in classification is intelligently outlined in a feature article scheduled for S & I in the near future, by Edward J. Beck.

OTHER feature articles slated for early production in our pages include **Bathrooms à la Mode**, by S. Gordon Taylor; **Cloth Ships in Peace and War**, by William Watts Chaplin; and an **Interview with Charles Lawrance**, designer of the Wright radial aero-engines, by Alfred M. Caddell.

Flower Odors From Flasks

By Robert E. Sadtler

(*Continued from page* 130)

with alcohol until a solution of the proper concentration is obtained.

7. Oil of Narcissus.—It is a colorless liquid having a very strong hyacinth-like odor. It boils at 205-207°C. It is prepared by dissolving 16 parts of methyl cinnamate in 20 parts of methyl alcohol, and treating the mixture with 20 parts of bromine. When the mixture is cooled it will solidify. Make up a solution of sodium hydroxide by dissolving 12 parts of sodium hydroxide in 24 parts of water. Shake the above mixture with this solution while keeping the temperature down to 40 degrees centigrade with a freezing mixture. At the end of two hours the mixture should be neutralized with dilute sulfuric acid. An oily layer will separate and this is mixed with 300 parts of water and 55 parts of sodium carbonate. Distil the resulting aldehyde in a current of steam and extract it with ether. Then evaporate the ether from the solution. It is rather difficult to make and keep this aldehyde in a pure condition due to its tendency to alter, therefore, it should only be made in small quantities.

Due to its powerful odor, it is best as a perfume in a very dilute solution of alcohol.

Care must be exercised in performing the above experiments not to use an excessive quantity of any of the chemicals mentioned. The perfumes will be obtained only when the exact quantities are used in accordance with the directions stated.

Make a Garden Seat

By J. E. Lovett

(*Continued from page* 143)

legs are mortised on their inside faces to receive the tenons on the rails, which are made barefaced on the outside and mitered in order to obtain as long a tenon as possible.

The seat rails are 4 inches wide by 1½ inches thick, the tenons are made about

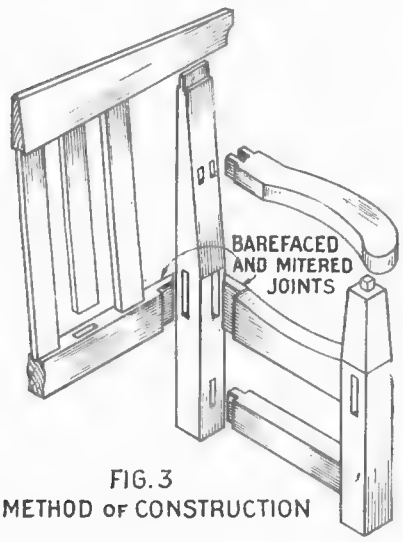


FIG. 3
METHOD OF CONSTRUCTION

half this thickness, ¾ inch. Before assembling, the two end seat rails are hollowed on their top edges to a depth of 1½ inches to give a concave surface to the seat.

The back is formed by vertical slats which are mortised about 1 inch deep into the bottom and top back seat rails respectively. The arms may be shaped as shown from 5 inches by 2 inches material and have twin tenons arranged to fit into extensions of the upward back legs.

The whole construction may be clearly understood by a study of Fig. 3. Before finally assembling, the various joints should be thoroughly painted with white lead and afterwards secured with ½ inch hardwood pins through the mortises and tenons. The framework of the seat may be considerably strengthened by fixing either hardwood angle blocks or metal angle ties as shown in plan.

The seat strips are about 2 inches wide by 7/8 inch thick and are securely screwed with brass screws to the seat rail.

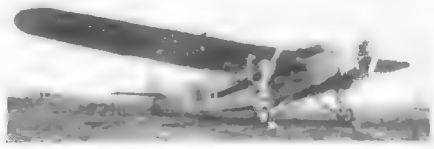
The Sky Talkers

(*Continued from page* 179)

public, telling them of the appearance of the Graf and the swarm of photographic news planes that hung so close about it they looked like those parasitic fish that fasten onto whales.

No planes were allowed to land at Lakehurst that day, but we landed at a little independent field about three miles off and I jumped the rear seat of a motorcycle and reached the hangar in time to report the landing of the dirigible on our special telegraph wire to New York.

One other time I used that plane and its telephone equipment, and on that occasion I called a number not in New



The "flying laboratory" of the Bell company.

York but in London. By short wave to Whippany, land wires to the jumping-off place in Maine of the regular trans-Atlantic radio telephone, and again by land wires to the London office, I was without any delay in conversation with a girl reporter recently assigned to foreign service.

She was Martha Dalrymple, whose last important assignment in America had been to travel with Mrs. Alfred E. Smith during the presidential campaign, and with whom I had worked in New York. We talked with considerable ease, although static and fading were far more noticeable on this occasion than in the shorter calls.

Well, what does it all mean? You may think you'd rather pay four and nine-tenths cents for that telephone call from the corner drugstore than use the whole nickel for the benefit of a lot of newspaper boys who like to romp around in the clouds, calling up their girl friends in foreign lands. But the newspaper boys aren't important, they are just the mirrors to show the rest of the world what is going on. What really matters and what makes your tenth of a cent worth while spending is the fact that your support is keeping a great staff of scientists at work delving into the mysteries of life and adding bit by bit to the sum total of human achievement.

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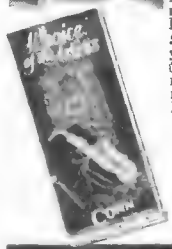

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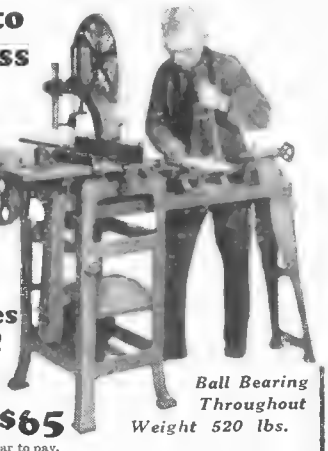

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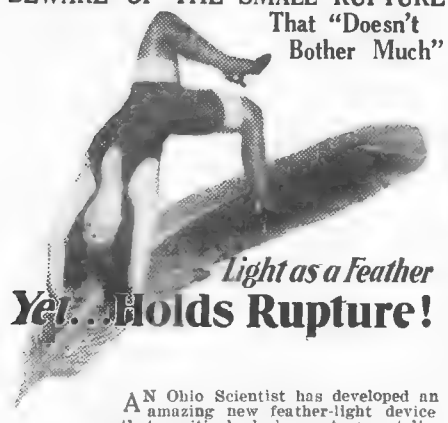

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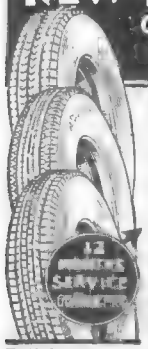

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33x4	2.95	1.15	28x5.25	2.95	1.35
34x4	3.50	1.15	30x5.25	2.95	1.35
32x4½	3.20	1.45	31x5.25	3.10	1.35
33x4½	3.20	1.45	30x5.77	3.20	1.40
34x4½	3.45	1.45	32x6.00	3.20	1.40
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How Fast Is Dynamite?

By G. St. J. Perrott

(*Continued from page* 117)

the induction coils are opened by the breaking of the wires threaded through the explosive. Sparks from the secondary circuits of the induction coils are thus caused to jump from a point to the soot-covered surface of a rotating drum. Two small dots corresponding to the breaking of each wire are produced, and since the distance between the wires is known and the distance between the dots can be measured, as well as the peripheral speed of the drum, it is a simple matter to calculate the speed of the explosive.

In another method developed by the Bureau of Mines, the detonation of the explosive is photographed by its own light on a rapidly revolving photograpic film shown in Figure 2. The camera is protected by a massive concrete wall. As the film moves rapidly in a horizontal direction and the image of the explosive flame travels vertically downward over the film, a sloped line is produced from which the speed of the explosive can be calculated. In Figure 3A the photograph on the left was taken with an ordinary camera, that on the right with the rotating film camera just described. The same is true of Figure 3B. Figure 3A is a photograph of a column of dynamite fired with a detonator placed in each end of it. This started detonation waves traveling toward each other with terrific speed and meeting near the center of the column of dynamite. The point of meeting of the waves is marked by a bright line. Figure 4 shows the method of calculating the speed of dynamite from the moving film photograph (Velocity $= \frac{d}{s} = \tan \Theta$; where d is the length of charge in meters and s is time in seconds). The speed at which dynamites detonate is an important factor in determining their suitability for various types of blasting, and these investigations by the Bureau of Mines are part of a program of measuring all the properties of dynamite that contribute to their efficiency in practical blasting operations.

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Solution to Cross Word Puzzle on Page 177

■	1	0	3	1	8	■	4	2	6	8	3	■
8	1	0	1	8	4	■	3	9	5	1	6	3
1	2	■	4	1	6	1	8	4	0	■	1	9
6	7	6	■	5	8	0	8	2	■	9	8	6
1	7	5	1	■	0	0	0	■	1	7	5	9
6	0	6	6	6	■	1	8	6	9	6	6	0
■	■	5	4	0	5	■	1	6	1	1	■	■
4	3	5	6	0	0	1	■	1	9	3	2	7
1	7	0	4	■	9	9	9	■	1	3	9	4
4	8	0	■	5	6	2	3	1	■	8	7	5
4	0	■	1	6	8	0	6	3	3	■	3	3
8	4	7	5	9	2	■	5	8	2	2	2	5
■	0	2	4	0	5	■	5	9	5	6	0	■

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"Merely on the Surface"

By S. Gordon Taylor

(*Continued from page* 119)

put on above a wainscot which is painted or paneled in wood.

One wall covering now available is made of cloth treated with pigment and oils. It has the appearance of fine wallpaper, but is waterproof and therefore washable. It is also far more durable. Its waterproof qualities make it particularly useful in bathrooms, but it is also being adopted extensively for other purposes.

Wood paneling offers an extremely attractive wall finish, but its use is to a large extent limited by the comparatively high cost.

For some interiors, wallpaper is most appropriate. (Wallpaper Manufacturers' Association.)

There are, however, a number of inexpensive substitutes which are realistic imitations of genuine wood panels. These are available in both roll and sheet form. Some of them are as enduring as wood and yet are comparatively inexpensive and easy to apply.

Another economical method of obtaining

Rough-Textured Stucco has a forceful charm of its own. (Atlas Portland Cement Co.)

Paint on plaster here provides a striking imitation of wood and stone. (The Stonetone Company.)

the appearance of wood panel walls is through special plastic paints, a treatment known under the trade name of "Timbertone." This paint is applied to the plaster surface, and when partially dry is marked with lines to simulate the cracks between the boards. Darker spots represent knots, and the grain of the wood is imitated in the surface finish. Its application calls for considerable skill on the part of the painter, but when properly applied it is difficult to distinguish from real wood. The resulting surface is washable.

The subject of quality and cost of materials is worthy of special consideration. Approximately 75 percent of the cost of painting and decorating goes for labor, and 25 percent for materials. The

The walls of this playroom are protected with a washable, stain-proof covering. (Standard Textile Products Co.)

materials represent such a small portion of the cost that it is unwise for the home owner to skimp on quality.

Usually the owner who does his own decorating will find it worth while to use ready-mixed paint. The process of mixing is a job for an expert.

Aside from economy, quality and durability, there is the question of color and reflecting value. Flat white is the best from the latter standpoint, with a reflecting value of 82 percent against 79 percent

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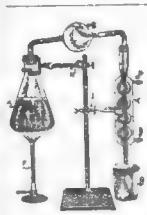

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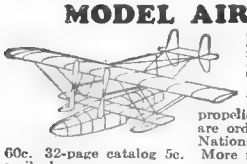

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for ivory white, 74 percent for cream, 55 percent for buff and so on down to 20 percent for olive green, 15 percent for medium brown and 7 percent for walnut wood paneling. In general, glossy finishes are undesirable for interior walls because they result in harmful glare and present a cold, harsh appearance.

The home owner who does his own painting is probably interested in possibilities offered by paint-spraying machines. There are several small types on the market, costing from a few dollars up. Small motor-driven sprays are very much worth

Wall panels of asbestos composition have an amazing resemblance to real oak. (Lyon and Taylor, Architects.)

while for certain types of work. Their advantage lies largely in their use for exterior painting. For exterior work, such sprayers save a great deal of time and effort and produce a most thorough job, particularly on rough surfaces, such as shingled exteriors, stucco and the like. One owner recently acquired a small electrically-driven spray machine to paint the outside of his home and found that the finished job, including the cost of the spray machine and paint was approximately one-third lower than the lowest bid received from painters to do the same job. His machine, therefore, much more than paid for itself on this one job.

Don't Dream of Roses Grow Them

By Dr. E. Bade

(*Continued from page* 120)

fertile garden soil, but the soil should be turned over to a depth of at least one and one half feet. Placed in a cold clayey or loamy soil or even in a very sandy soil, they will give little if any success. Such soils must be prepared before roses can be cultivated, and for the best possible results every kind of a soil ought to be pre-cultivated and adapted for rose culture. As a rule, if the earth is deeply dug and well-rotted manure added, a loamy soil will give excellent results, provided plenty of liquid manure is supplied after the first few years of growth.

Never supply manure directly to the soil. It does more harm than good. In preparing the soil for roses, well-rotted manure is excellent, but even better results are obtained if compost is taken. Then,

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THE SCIENCE AND INVENTION Basement Utilization Contest is in its last month, but there is still time to send in the plan that may get you a share in the $400 cash awards.

The idea is to present a practical plan for converting waste basement space into attractive, comfortable rooms for work, relaxation, or recreation. The basement may be yours, someone else's, or nobody's—it may be real, imaginary, or proposed.

The contest is open to all readers. You can send in as many plans as you please. Each plan should be made the subject of a separate letter. No letter should exceed 1,000 words.

A drawing will help the jury to understand your idea. Make a rough sketch showing the approximate dimensions of the basement, location of doors and other openings, permanent equipment, etc. For a planned remodeling, send two drawings, one showing the basement as is, the other showing the changes you propose. In this case, divide your letter into three parts. In the first describe the existing basement; in the second describe the changes you propose; in the third describe the materials and methods you propose for its transformation; wall, floor and ceiling treatments; kind and purpose of partitions, if any; provisions for damp-proofing, heating, ventilation, lighting, etc.

For a basement already remodeled, limit your letter to the basement as is, describing the means and methods used to make it comfortable and attractive. For a proposed new basement, describe the materials and methods you intend using to make it dry, comfortable, and attractive, also the equipment you mean to install.

Interesting hints on materials, methods, and equipment are available in the booklets listed on page 191 of the present issue. Order by number. For other information see S. Gordon Taylor's article on basement conversion in the March number of SCIENCE AND INVENTION, also the article on damp-proofing your cellar, in the same issue, by J. W. Von Stein.

Typewrite your letter if possible. However, this is not essential. Use only one side of each sheet and place your name and address on each.

The jury will select as the winning plans those which are best from the standpoint of comfort, attractiveness, and ingenuity of arrangement, allotting them prizes in the order of their merit. But to be considered on these grounds, a plan must be capable of being worked out in practice.

The decision of the jury will be final. The full amount of the prize involved will be awarded each tying contestant in case of a tie. Not more than one prize will be given any one contestant.

The Contest opened February 10 and will close at midnight on May 31. All entries, to be eligible, must be received by SCIENCE AND INVENTION, 381 Fourth Avenue, New York, N. Y., before that time.

Prize winners will be notified approximately two weeks after the closing date. Their names will be announced also in the September issue of this magazine.

Duplicate copies of plans should be held by readers desiring them.

SCIENCE AND INVENTION reserves the privilege of publishing any idea received. Entries thus published will be paid for on publication at the rate of five dollars each, if they have been awarded no regular prizes.

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too, plenty of lime should be provided, for it aids in the formation of healthy wood. For weeks before planting the soil should lie idle, after having been completely cultivated.

The hole in which roses are planted should be of sufficient size to permit the spreading of the roots, while the distance at which the plants are to be spaced depends upon the type of rose selected. They should be sufficiently far apart so that, when fully mature, the individual plants do not disturb each other's growth. *Rugosa* is spaced about three feet, baby ramblers about two feet, while the various hybrids are spaced four, five or six feet.

A short and stubby plant is better than a tall straggly one. The more hardy types are planted during the fall, and those that fear the frost, like the tea roses, are planted in the spring. If desired, almost any rose may be planted at this latter time.

The stock should be planted as soon as possible after it is received. If this is not practicable, the stock should be unpacked, and the roots, still in a bunch, dug into the soil in some out-of-the-way spot. If the roots are quite dry, the stock should be placed in water for at least an hour, longer if necessary, and then dug into the ground. Should the stock be frozen when it is received, it must be placed where it may thaw gradually. When the time for planting has arrived, the stock is dug up, a moist rag is wrapped around the roots, and it is carried to the place where it is to stand. This is necessary, no matter how long or how short the distance that they are carried. The neglect of this principle has caused the death of more roses than any other factor. Just before the roses are planted, the roots are dipped into a loamy mud and afterward set into the ground, care being taken to see that they are placed just a little deeper in the soil than they were originally planted. If planted too high, the roots will dry out and the plant will die. Planted too deeply, the bark is injured, growth is retarded and normal growth only takes place when new roots have been developed near the surface of the soil. Fresh manure should never be placed in the planting hole. This only destroys the roots and kills the rose.

Roses planted during the resting period are examined, and all roots which are injured are cut off with a sharp knife just before the stock is placed in the soil. A little sifted soil is first spread about in the hole; then the rose plant is placed in position, the roots are spread into a natural position, and more sifted soil is added. This is gently pressed down. Then more soil is sifted in and, when the hole is nearly full, the plant is gently lifted up and down so that the fine soil may work itself between the roots, care being taken not to jerk so hard as to injure the root fibers. Then plenty of water is added, the hole being filled a number of times, so that the soil becomes muddy. This also aids in washing the soil between the roots. Since this causes the soil to sink, the rose will sink with it; therefore the stock is again gently lifted so as to bring it into its correct position. Then the hole is filled with soil level with the surface. No more water is now required, unless a spell of dry weather sets in.

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Natural Gas—Another Gold Mine

By Alfred M. Caddell, *Financial Editor*

NATURAL gas is by no means new to industry and consumers. It has been known ever since oil wells have been drilled. When some wells are brought in the roar of the gas escaping from them can be heard for miles. Sometimes this gas catches fire, and it is not an infrequent sight in the oil fields to see streams of flame mount hundreds of feet into the night air.

For many years, natural gas was looked upon as a by-product, because of the difficulty and cost of piping to large consuming centers. Now, however, with giant networks of pipe lines coming into being, every natural gas well is looked upon as a potential gold mine.

Steps have already been taken to pipe natural gas from the oil fields in Texas to Chicago and other points, some of these communities being more than 1,000 miles away. Conceivably, within a few years the whole country will be covered with pipe line networks, and reservoir systems of natural gas, possibly supplemented with artificial gas control, will be established at strategic points.

More and more, natural gas companies are coöperating with local public utility companies in many regions to stimulate the use of more natural gas. This commodity has several advantages over the artificial kind. It can be laid down cheaper to the consumer and its heat efficiency is greater. Experts are agreed that once the high costs of laying the pipe line are taken care of, cities can be supplied with natural gas, which may have a heat content of 1,100 B.T.U. (British thermal units) at the same price or lower than the present price of manufactured gas which has a heat content of about 530 B.T.U.

Industrial use of natural gas has increased to such an extent that many important industrial and manufacturing plants use it entirely instead of coal. These include various plants of the Owens-Illinois Glass Co., American Smelting and Refining Co., the Portland Cement Co., and many others. Therefore, as gas is made available in the more highly industrialized centers of the East, this trend undoubtedly will enlarge its home consumption. The fact that it is more easily handled than other fuels, and that it is delivered to the plant or consumer directly from its source, thereby eliminating the tying up of capital in fuel inventories, is one of the main factors in its economic distribution.

The extension of natural gas by the public utility companies will probably follow the procedure of the large electric power companies in their development of hydro-electric power, by forming large combinations to bring the power from its sources to industrial centers. Grouping of producers, pipe line companies and distributors should be most advantageous for the advancement of this potentially enormous industry.

The Insull Interests, the Standard Oil Co. of New Jersey, Cities Service, Texas Corporation, United Carbon, Columbia Carbon and others are at present negotiating for the financing and construction of a double pipe line from Texas to Chicago, which will be the largest of its kind in the world. The new combination of the Electric Power and Light Corporation, subsidiary of Electric Bond and Share, and the United Gas Co., with its wholly owned subsidiaries; the Louisiana Gas and Fuel Co., the Magnolia Gas Co. and the Mississippi River Fuel Co. have enormously rich natural gas fields. Already the supply from these fields is transported by pipe lines to New Orleans, Birmingham, Atlanta, Fort Worth, Dallas and St. Louis. The United Gas has lately added holdings along the Texas seaboard. Columbia Gas and Electric operates one of the largest and most extensive systems in this industry. At present, it is negotiating to supply the larger cities in Virginia and adjacent states. In the past year they completed a pipe line which cuts across Northwestern Pennsylvania, Southern New York State and into Northern New Jersey, near Newark.

The cost of gas from the Appalachian gas field, which parallels the Appalachian mountains, runs from 35 to 55 cents per 1,000 cubic feet. But the fields of Louisiana, Arkansas, Texas, Kansas and Oklahoma produce gas at a price of from three to seven cents per 1,000 cu. feet. This compares very favorably against the much higher prices for manufactured gas, which in New York City is now $1.15 per 1,000 cu. feet.

There are innumerable gas fields in the United States—the Amarillo (Texas) is the largest developed up to the present time, and there are innumerable companies in a position to cash in on the enlarging public demand for this product. The industry as a whole is growing by leaps and bounds with scarcely an end in sight. It is one of the great American basics that affect investors and consumers alike, and like its counterpart, the electrical industry, it gives promise of growing in the proportions of geometrical ratio.

Questions and Answers

Conducted by Alfred M. Caddell

Information on securities will be furnished readers of "SCIENCE AND INVENTION" free of charge by mail and through these columns. A 2-cent stamped, self-addressed envelope should be included in your letter. Address your inquiries to the Financial Editor, Science and Invention, 381 Fourth Ave., New York City.

Question—I have been solicited to buy some S. W. Straus bonds. Do you consider these safe? L. A. N., Yonkers, N. Y.

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Question—What do you know about The Grand Union Company—is their business growing? J. R. B., Hazelton, Pa.

Answer—This company now ranks about seventh or eighth in total sales among American chain food systems. Its wagon-route business, which yields an excellent profit margin, is the second largest organization of this sort. The company has enjoyed steady increases in business over a number of years. In 1925, net income was $259,000, while in 1929 net totaled $1,021,000, equal to $6.25 on the preferred and $2.03 on the common. It has no funded debt, and the preferred is convertible into 1½ shares of common at any time. Chain food companies have hung up some fine earnings records, and there is every reason to believe that this company will continue to do so.

Question—I own some Butte & Superior Mining Co. shares and do not know if I should sell. What would you advise? P. K. D., St. Paul, Minn.

Answer—This company is largely in the state of liquidation at present. According to official estimates, life of property is only a few more years. Exploration work has yielded discouraging results. If no success is had in future search for commercial ore bodies, the stock will have little value left within a few years. In 1927, company earned 94 cents per share; in 1928, 28 cents and in 1929 sustained a loss of $5,983 after expenses and taxes but before depreciation. The 50-cent quarterly dividend has therefore been omitted and will hardly be resumed in the near future. The company owns about one-fifth of the stock of the American Zinc, Lead & Smelting Co., which is one of its main assets

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Getting Up Steam

By J. B. Crane

(*Continued from page* 137)

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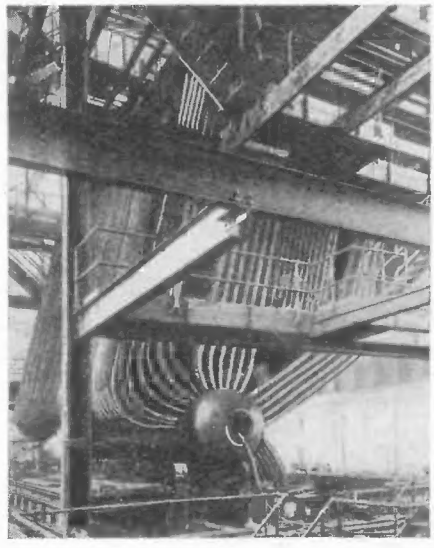

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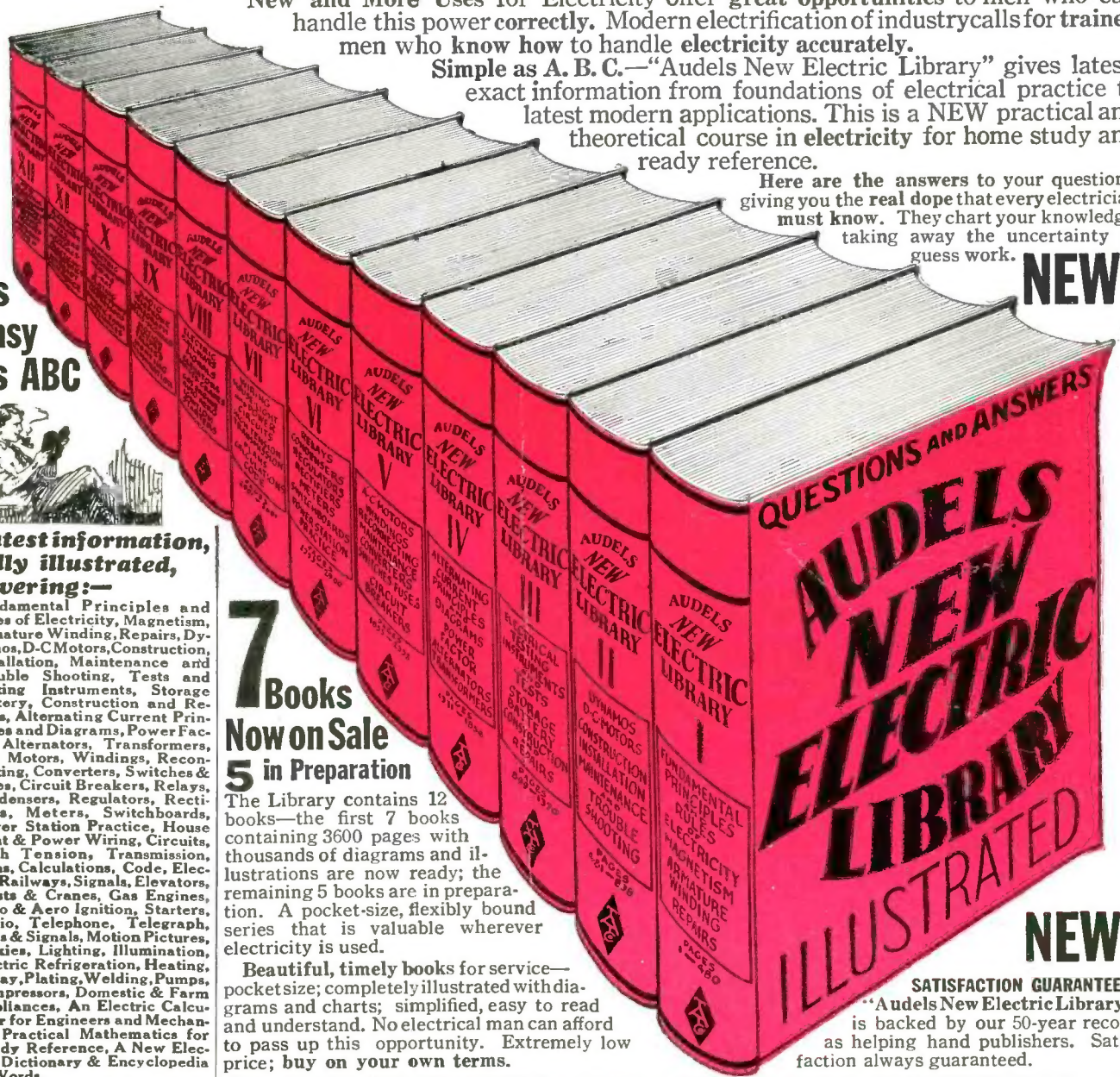

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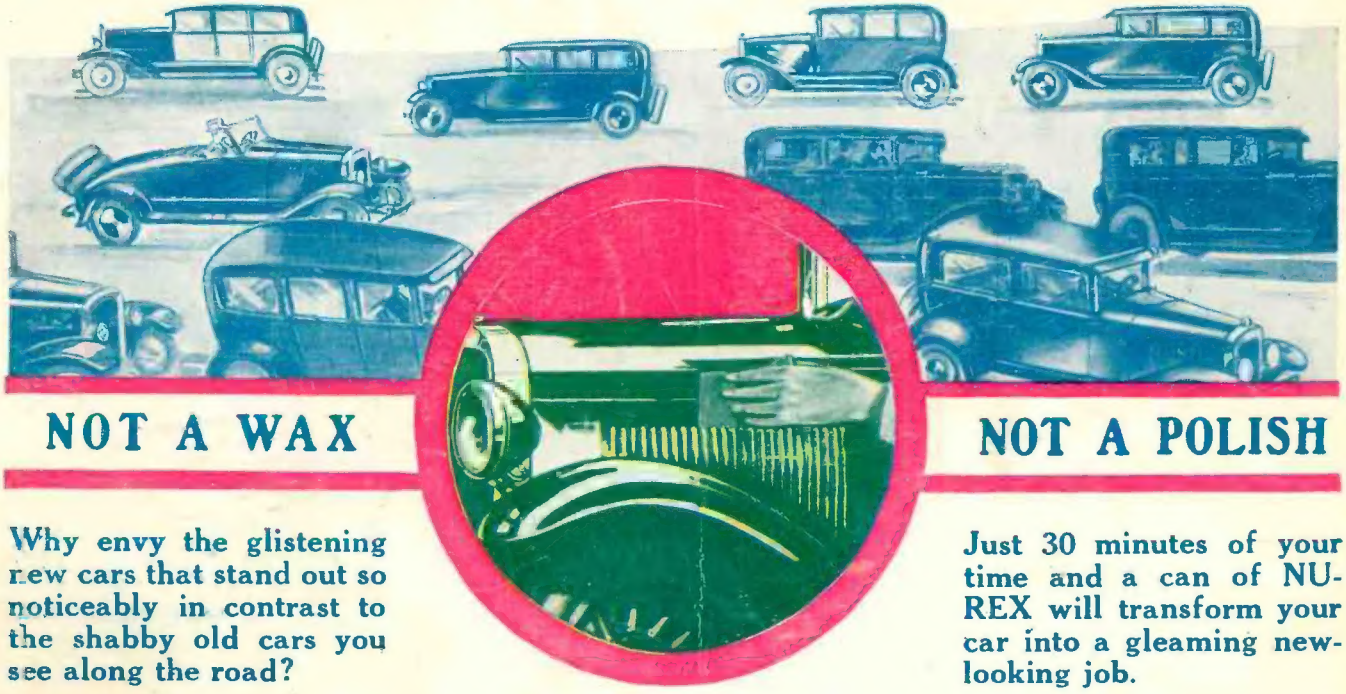

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